

The SEAMAN's  
Daily Assistant:

B E I N G

A Short, Easy, and Plain Method

O F K E E P I N G

A JOURNAL at SEA;

In which are contained,

R U L E S,

S H E W I N G

How the Allowances for Lee-way, Variation, Heave of the Sea, Set of Currents, &c. are to be made; and to correct the Dead-Reckoning by an Observation in all Cases: And also all the TABLES that are any ways necessary for the SEAMAN's Use in keeping a Journal,

---

By THOMAS HASELDEN,  
Late Teacher of the MATHEMATICS in the  
ROYAL NAVY.

---

D U B L I N :

Printed by the Executors of DAVID HAY, Assignee of the late  
BOULTER GRIERSON, Printer to the King's most Excellent Majesty.

M,DCC,LXXIV.





u/dw/-

T O T H E  
R E A D E R.

**H**A V I N G been educated in the Theory of Navigation, almost from my Childhood, and having had about sixteen Years Experience of the practical Part, at Sea, both in the Merchants Service, and also as Teacher of the Mathematics in the Royal Navy ; and having, in the Course of that Time, made a general Observation, that there are Numbers of Seamen who would gladly keep a Reckoning, had they any short, easy, and plain Method to do it by ; but are deterred from it by the Want of such a Thing. And also, that there are many who have thrown their Money away to little or no Purpose, by going to School to some Masters, (of which Sort there are too many) that they have only got a Smattering of the Theory, and a few Terms of Art by Rote, which enable them to talk in such a Manner as to deceive those that go to learn of them, but having never been at Sea, cannot know any thing of the Practice.

Therefore, for the Use of such in particular, and of all other Seafaring Men in general, I have written the following Treatise ; in which, I think, I have inserted all the Rules, and all the Tables, with their Uses, that are necessary to be used in any Case at Sea : And also, particular Rules for keeping a Journal, with the Manner of correcting the Dead-Reckoning by an Observation, either for one Day, or for a longer Time ; the first of which, *viz.* Correcting for one Day, has been treated of by several Authors ; but the latter, *viz.* Correcting for a longer Time, I know has been barely mentioned in several, but not particularly explained in any Author at all, I believe, at least in none that I have read ; And for that Reason I have done it in the Journal at the latter End of this Book, it being absolutely necessary for every Man that

## To the R E A D E R.

keeps a Reckoning to know it ; because they are more likely to be out in their Reckoning, when they have been some Days without an Observation, than when they have one every Day, and consequently more likely to have Occasion to correct for three or four Days, than for a single one.

I have not begun this Book with Arithmetic, as most of the Books on this Subject do ; because I think, that if any Person has had so little Education, as not to be capable of Adding, Subtracting, Multiplying, and Dividing, he will hardly be able to make any Progress, either in Arithmetic or Navigation, by the Help of Books alone, without the Assistance of a Master : So that I think putting such Things into Books of this Kind, serve only to enhance the Price, and are of no Service to the Reader. And now having given an Account of the Reasons that induced me to publish this Book (which I hope, and am pretty well assured, will be found the most useful Book of it's Kind, now in Print) for the daily Practice at Sea, I have nothing more to add, but to beg the Readers kind Acceptance of my Endeavours,

Who am,

Their humble Servant,

Thomas Haselden.

T H E



---

---

T H E

# C O N T E N T S.

- 1 **A** Table of Difference of Latitude and Departure to every single Degree, and as far as 300 Miles Distance, from Page 1 to Page 45.
- 2 A Table of Numbers, for the readier finding the Course in the Tables of Difference of Latitude and Departure, when any two Sides are given, Page 46.
- 3 The Use of the two foregoing Tables, in working the six Cases of Plain Sailing, Page 47 to 51.
- 4 The Use of the Tables of Difference of Latitude and Departure in working a Traverse, Page 52.
- 5 To work any Case in Mercator, Middle Latitude, Parallel, or any Right-angled Plain Triangle, Pages 53 and 54.
- 6 The first Case of Mercator (being the most useful Case at Sea) particularly explained and worked at large, Pages 55 and 56.
- 7 A Table to turn Points into Degrees, &c. Page 56.
- 8 A Figure, shewing how many Points from the Meridian any Course steered is, Page 57.
- 9 A Table of Difference of Latitude and Departure, to every  $\frac{1}{4}$  Point, and to 300 Miles Distance, Pages 58 to 73.
- 10 Tables of Numbers for any Days, and the Times answering to them, being of Use for the ready finding the Time of High-Water, at any Place, Pages 74 to 78.
- 11 The Use of the Tables of Numbers and Times, Page 70.
- 12 A Tide Table, shewing the Time of High-Water upon the Full and Change of the Moon, at any of the Places contained therein, Pages 80 to 83.
- 13 The Use of the three foregoing Tables in finding the Time of High-water at any Place, and on any Day, Page 84.
- 14 Tables of the Sun's Declination for 15 Years to come, P. 85 to 88.

# The C O N T E N T S.

- 15 A Table of the Variation of the Sun's Declination, Page 89.
- 16 The Use of the Tables of Declination, and it's Variation, Page 90.
- 17 A Table of the Sun's Right Ascension, Page 91.
- 18 A Table of the Right Ascension and Declination of some of the principal fixed Stars, Pages 92 and 93.
- 19 Rules for working an Observation by the Sun or Stars, Pages 94 and 95.
- 20 The Use of the Table of the Sun and Stars Right Ascension, Page 96.
- 21 A Table of the Latitudes and Longitudes of Places, Page 97 to 104.
- 22 Rules for Latitude, Pages 104 and 105.
- 23 Rules for Longitude, Pages 106, 107, and 108.
- 24 A Table of the Meridional Parts to every Degree and Minute, with it's Use, Pages 109 to 115.
- 25 A Table of Amplitudes, Pages 116 to 121.
- 26 The Use of the Table of Amplitudes, with Rules for finding the Variation of the Compass, Pages 121 to 125.
- 27 Rules for keeping a Journal, Pages 126 to 129.
- 28 Rules for correcting the Dead-Reckoning by an Observation, Pages 130 to 132.
- 29 Rules for the Meridian Distance, Page 132.
- 30 A Journal, with its different Varieties of Variation, Leeway, Laying-too, Calms, Currents, Heave of the Sea, &c. and also all the different Cases of correcting, from Page 133 to 155.
- 31 Rules to find what Course and Distance the Ship has made by the Reckoning, from one Place to another, Pages 155 and 156.
- 32 Rules to find the Bearing and Distance of any Place from the Ship, Page 156.
- 33 Rules for correcting from the Time of leaving the Land, to the first Observation, Pages 157 and 158.
- 34 Rules to lay off the Place of the Ship on the Mercator's Chart, and to find the Bearing and Distance of any Place from the Ship, Pages 159 and 160.

*Note,* All the forementioned Tables are newly and carefully calculated, and the Tables of Latitude and Longitude carefully corrected, from the best Authors and Charts.





A  
T A B L E  
O F  
DIFFERENCE of LATITUDE  
A N D  
D E P A R T U R E  
To every Single D E G R E E,  
And as far as 300 Miles DISTANCE.





THE

OFFICE

OF THE

NAVY

DEPARTMENT



OF THE

NAVY

DEPARTMENT

OF THE

# Difference of Latitude and Departure for 1 Deg.

1

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	51.0	00.9	101	101.0	01.8	151	151.0	02.6	201	201.0	03.5	251	251.0	04.3
2	02.0	00.0	52	52.0	00.9	102	102.0	01.8	152	152.0	02.6	202	202.0	03.5	252	252.0	04.3
3	03.0	00.1	53	53.0	00.9	103	103.0	01.8	153	153.0	02.6	203	203.0	03.5	253	253.0	04.3
4	04.0	00.1	54	54.0	00.9	104	104.0	01.8	154	154.0	02.7	204	204.0	03.5	254	254.0	04.4
5	05.0	00.1	55	55.0	01.0	105	105.0	01.8	155	155.0	02.7	205	205.0	03.5	255	255.0	04.4
6	06.0	00.1	56	56.0	01.0	106	106.0	01.8	156	156.0	02.7	206	206.0	03.5	256	256.0	04.4
7	07.0	00.1	57	57.0	01.0	107	107.0	01.9	157	157.0	02.7	207	207.0	03.6	257	257.0	04.4
8	08.0	00.1	58	58.0	01.0	108	108.0	01.9	158	158.0	02.7	208	208.0	03.6	258	258.0	04.4
9	09.0	00.2	59	59.0	01.0	109	109.0	01.9	159	159.0	02.7	209	209.0	03.6	259	259.0	04.4
10	10.0	00.2	60	60.0	01.1	110	110.0	01.9	160	160.0	02.8	210	210.0	03.6	260	260.0	04.5
11	11.0	00.2	61	61.0	01.1	111	111.0	01.9	161	161.0	02.8	211	211.0	03.6	261	261.0	04.5
12	12.0	00.2	62	62.0	01.1	112	112.0	01.9	162	162.0	02.8	212	212.0	03.6	262	262.0	04.5
13	13.0	00.2	63	63.0	01.1	113	113.0	02.0	163	163.0	02.8	213	213.0	03.7	263	263.0	04.5
14	14.0	00.2	64	64.0	01.1	114	114.0	02.0	164	164.0	02.8	214	214.0	03.7	264	264.0	04.5
15	15.0	00.3	65	65.0	01.1	115	115.0	02.0	165	165.0	02.9	215	215.0	03.7	265	265.0	04.6
16	16.0	00.3	66	66.0	01.2	116	116.0	02.0	166	166.0	02.9	216	216.0	03.7	266	266.0	04.6
17	17.0	00.3	67	67.0	01.2	117	117.0	02.0	167	167.0	02.9	217	217.0	03.7	267	267.0	04.6
18	18.0	00.3	68	68.0	01.2	118	118.0	02.1	168	168.0	02.9	218	218.0	03.8	268	268.0	04.6
19	19.0	00.3	69	69.0	01.2	119	119.0	02.1	169	169.0	02.9	219	219.0	03.8	269	269.0	04.6
20	20.0	00.4	70	70.0	01.2	120	120.0	02.1	170	170.0	02.9	220	220.0	03.8	270	270.0	04.6
21	21.0	00.4	71	71.0	01.2	121	121.0	02.1	171	171.0	03.0	221	221.0	03.8	271	271.0	04.7
22	22.0	00.4	72	72.0	01.3	122	122.0	02.1	172	172.0	03.0	222	222.0	03.8	272	272.0	04.7
23	23.0	00.4	73	73.0	01.3	123	123.0	02.1	173	173.0	03.0	223	223.0	03.8	273	273.0	04.7
24	24.0	00.4	74	74.0	01.3	124	124.0	02.2	174	174.0	03.0	224	224.0	03.9	274	274.0	04.7
25	25.0	00.4	75	75.0	01.3	125	125.0	02.2	175	175.0	03.0	225	225.0	03.9	275	275.0	04.7
26	26.0	00.5	76	76.0	01.3	126	126.0	02.2	176	176.0	03.0	226	226.0	03.9	276	276.0	04.7
27	27.0	00.5	77	77.0	01.3	127	127.0	02.2	177	177.0	03.1	227	227.0	03.9	277	277.0	04.8
28	28.0	00.5	78	78.0	01.4	128	128.0	02.2	178	178.0	03.1	228	228.0	03.9	278	278.0	04.8
29	29.0	00.5	79	79.0	01.4	129	129.0	02.2	179	179.0	03.1	229	229.0	03.9	279	279.0	04.8
30	30.0	00.5	80	80.0	01.4	130	130.0	02.3	180	180.0	03.1	230	230.0	04.0	280	280.0	04.8
31	31.0	00.5	81	81.0	01.4	131	131.0	02.3	181	181.0	03.1	231	231.0	04.0	281	281.0	04.8
32	32.0	00.6	82	82.0	01.4	132	132.0	02.3	182	182.0	03.1	232	232.0	04.0	282	282.0	04.8
33	33.0	00.6	83	83.0	01.5	133	133.0	02.3	183	183.0	03.2	233	233.0	04.0	283	283.0	04.9
34	34.0	00.6	84	84.0	01.5	134	134.0	02.3	184	184.0	03.2	234	234.0	04.0	284	284.0	04.9
35	35.0	00.6	85	85.0	01.5	135	135.0	02.3	185	185.0	03.2	235	235.0	04.0	285	285.0	04.9
36	36.0	00.6	86	86.0	01.5	136	136.0	02.4	186	186.0	03.2	236	236.0	04.1	286	286.0	04.9
37	37.0	00.6	87	87.0	01.5	137	137.0	02.4	187	187.0	03.2	237	237.0	04.1	287	287.0	04.9
38	38.0	00.7	88	88.0	01.5	138	138.0	02.4	188	188.0	03.2	238	238.0	04.1	288	288.0	04.9
39	39.0	00.7	89	89.0	01.6	139	139.0	02.4	189	189.0	03.3	239	239.0	04.1	289	289.0	05.0
40	40.0	00.7	90	90.0	01.6	140	140.0	02.4	190	190.0	03.3	240	240.0	04.1	290	290.0	05.0
41	41.0	00.7	91	91.0	01.6	141	141.0	02.4	191	191.0	03.3	241	241.0	04.1	291	291.0	05.0
42	42.0	00.7	92	92.0	01.6	142	142.0	02.5	192	192.0	03.3	242	242.0	04.2	292	292.0	05.0
43	43.0	00.8	93	93.0	01.6	143	143.0	02.5	193	193.0	03.3	243	243.0	04.2	293	293.0	05.0
44	44.0	00.8	94	94.0	01.6	144	144.0	02.5	194	194.0	03.3	244	244.0	04.2	294	294.0	05.0
45	45.0	00.8	95	95.0	01.7	145	145.0	02.5	195	195.0	03.4	245	245.0	04.2	295	295.0	05.1
46	46.0	00.8	96	96.0	01.7	146	146.0	02.5	196	196.0	03.4	246	246.0	04.2	296	296.0	05.1
47	47.0	00.8	97	97.0	01.7	147	147.0	02.5	197	197.0	03.4	247	247.0	04.2	297	297.0	05.1
48	48.0	00.8	98	98.0	01.7	148	148.0	02.6	198	198.0	03.4	248	248.0	04.3	298	298.0	05.1
49	49.0	00.9	99	99.0	01.7	149	149.0	02.6	199	199.0	03.4	249	249.0	04.3	299	299.0	05.1
50	50.0	00.9	100	100.0	01.7	150	150.0	02.6	200	200.0	03.4	250	250.0	04.3	300	300.0	05.1
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

C

for 89 Deg.



## Difference of Latitude and Departure for 2 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	51.0	00.8	101	100.9	03.5	151	150.9	05.3	201	200.9	07.0	251	250.8	08.8
2	02.0	00.1	52	52.0	01.8	02	101.9	03.6	52	151.9	05.3	02	201.9	07.1	52	251.8	08.8
3	03.0	00.1	53	53.0	01.8	03	102.9	03.6	53	152.9	05.4	03	202.9	07.1	53	252.8	08.9
4	04.0	00.1	54	54.0	01.9	04	103.9	03.6	54	153.9	05.4	04	203.9	07.1	54	253.8	08.9
5	05.0	00.2	55	55.0	01.9	05	104.9	03.7	55	154.9	05.4	05	204.9	07.2	55	254.8	08.9
6	06.0	00.2	56	56.0	02.0	106	105.9	03.7	156	155.9	05.5	206	205.9	07.2	256	255.8	09.0
7	07.0	00.2	57	57.0	02.0	07	106.9	03.7	57	156.9	05.5	07	206.9	07.2	57	256.8	09.0
8	08.0	00.3	58	58.0	02.0	08	107.9	03.8	58	157.9	05.5	08	207.9	07.3	58	257.8	09.0
9	09.0	00.3	59	59.0	02.1	09	108.9	03.8	59	158.9	05.6	09	208.9	07.3	59	258.8	09.1
10	10.0	00.4	60	60.0	02.1	10	109.9	03.9	60	159.9	05.6	10	209.9	07.4	60	259.8	09.1
11	11.0	00.4	61	61.0	02.1	111	110.9	03.9	161	160.9	05.6	211	210.9	07.4	261	260.8	09.1
12	12.0	00.4	62	62.0	02.2	12	111.9	03.9	62	161.9	05.7	12	211.9	07.4	62	261.8	09.2
13	13.0	00.5	63	63.0	02.2	13	112.9	04.0	63	162.9	05.7	13	212.9	07.5	63	262.8	09.2
14	14.0	00.5	64	64.0	02.2	14	113.9	04.0	64	163.9	05.7	14	213.9	07.5	64	263.8	09.2
15	15.0	00.5	65	65.0	02.3	15	114.9	04.0	65	164.9	05.8	15	214.9	07.5	65	264.8	09.3
16	16.0	00.6	66	66.0	02.3	116	115.9	04.1	166	165.9	05.8	216	215.9	07.6	266	265.8	09.3
17	17.0	00.6	67	67.0	02.3	17	116.9	04.1	67	166.9	05.8	17	216.9	07.6	67	266.8	09.3
18	18.0	00.6	68	68.0	02.4	18	117.9	04.1	68	167.9	05.9	18	217.9	07.6	68	267.8	09.4
19	19.0	00.7	69	69.0	02.4	19	118.9	04.2	69	168.9	05.9	19	218.9	07.7	69	268.8	09.4
20	20.0	00.7	70	70.0	02.4	20	119.9	04.2	70	169.9	06.0	20	219.9	07.7	70	269.8	09.5
21	21.0	00.7	71	71.0	02.5	121	120.9	04.2	171	170.9	06.0	221	220.9	07.7	271	270.8	09.5
22	22.0	00.8	72	72.0	02.5	22	121.9	04.3	72	171.9	06.0	22	221.9	07.8	72	271.8	09.5
23	23.0	00.8	73	73.0	02.5	23	122.9	04.3	73	172.9	06.1	23	222.9	07.8	73	272.8	09.6
24	24.0	00.8	74	74.0	02.6	24	123.9	04.3	74	173.9	06.1	24	223.9	07.8	74	273.8	09.6
25	25.0	00.9	75	75.0	02.6	25	124.9	04.4	75	174.9	06.1	25	224.9	07.9	75	274.8	09.6
26	26.0	00.9	76	76.0	02.7	126	125.9	04.4	176	175.9	06.2	226	225.9	07.9	276	275.8	09.7
27	27.0	00.9	77	77.0	02.7	27	126.9	04.4	77	176.9	06.2	27	226.9	07.9	77	276.8	09.7
28	28.0	01.0	78	78.0	02.7	28	127.9	04.5	78	177.9	06.2	28	227.9	08.0	78	277.8	09.7
29	29.0	01.0	79	79.0	02.8	29	128.9	04.5	79	178.9	06.3	29	228.9	08.0	79	278.8	09.8
30	30.0	01.1	80	80.0	02.8	30	129.9	04.6	80	179.9	06.3	30	229.9	08.1	80	279.8	09.8
31	31.0	01.1	81	81.0	02.8	131	130.9	04.6	181	180.9	06.3	231	230.9	08.1	281	280.8	09.8
32	32.0	01.1	82	81.9	02.9	32	131.9	04.6	82	181.9	06.4	32	231.9	08.1	82	281.8	09.9
33	33.0	01.2	83	82.9	02.9	33	132.9	04.7	83	182.9	06.4	33	232.9	08.2	83	282.8	09.9
34	34.0	01.2	84	83.9	02.9	34	133.9	04.7	84	183.9	06.4	34	233.9	08.2	84	283.8	10.0
35	35.0	01.2	85	84.9	03.0	35	134.9	04.7	85	184.9	06.5	35	234.9	08.2	85	284.8	10.0
36	36.0	01.3	86	85.9	03.0	136	135.9	04.8	186	185.9	06.5	236	235.9	08.3	286	285.8	10.0
37	37.0	01.3	87	86.9	03.0	37	136.9	04.8	87	186.9	06.5	37	236.9	08.3	87	286.8	10.0
38	38.0	01.3	88	87.9	03.1	38	137.9	04.8	88	187.9	06.6	38	237.9	08.3	88	287.8	10.1
39	39.0	01.4	89	88.9	03.1	39	138.9	04.9	89	188.9	06.6	39	238.9	08.4	89	288.8	10.1
40	40.0	01.4	90	89.9	03.1	40	139.9	04.9	90	189.9	06.7	40	239.9	08.4	90	289.8	10.2
41	41.0	01.4	91	90.9	03.2	141	140.9	04.9	191	190.9	06.7	241	240.9	08.4	291	290.8	10.2
42	42.0	01.5	92	91.9	03.2	42	141.9	05.0	92	191.9	06.7	42	241.9	08.5	92	291.8	10.2
43	43.0	01.5	93	92.9	03.2	43	142.9	05.0	93	192.9	06.8	43	242.9	08.5	93	292.8	10.3
44	44.0	01.5	94	93.9	03.3	44	143.9	05.0	94	193.9	06.8	44	243.9	08.5	94	293.8	10.3
45	45.0	01.6	95	94.9	03.3	45	144.9	05.1	95	194.9	06.8	45	244.9	08.6	95	294.8	10.3
46	46.0	01.6	96	95.9	03.4	146	145.9	05.1	196	195.9	06.9	246	245.9	08.6	296	295.8	10.4
47	47.0	01.6	97	96.9	03.4	47	146.9	05.1	97	196.9	06.9	47	246.9	08.6	97	296.8	10.4
48	48.0	01.7	98	97.9	03.4	48	147.9	05.2	98	197.9	06.9	48	247.9	08.7	98	297.8	10.4
49	49.0	01.7	99	98.9	03.5	49	148.9	05.2	99	198.9	07.0	49	248.9	08.7	99	298.8	10.5
50	50.0	01.7	100	99.9	03.5	150	149.9	05.3	200	199.9	07.0	250	249.9	08.8	300	299.8	10.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 88 Deg.



# Difference of Latitude and Departure for 3 Deg.

3

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.9	02.7	101	100.9	05.3	151	150.8	07.9	201	200.7	10.5	251	250.6	13.1
2	02.0	00.1	52	51.9	02.7	102	101.9	05.3	152	151.8	08.0	202	201.7	10.6	252	251.6	13.2
3	03.0	00.2	53	52.9	02.8	103	102.9	05.4	153	152.8	08.0	203	202.7	10.6	253	252.6	13.2
4	04.0	00.2	54	53.9	02.8	104	103.9	05.4	154	153.8	08.1	204	203.7	10.7	254	253.6	13.3
5	05.0	00.3	55	54.9	02.9	105	104.9	05.5	155	154.8	08.1	205	204.7	10.7	255	254.6	13.3
6	06.0	00.3	56	55.9	02.9	106	105.9	05.5	156	155.8	08.2	206	205.7	10.8	256	255.6	13.4
7	07.0	00.4	57	56.9	03.0	107	106.9	05.6	157	156.8	08.2	207	206.7	10.8	257	256.6	13.4
8	08.0	00.4	58	57.9	03.0	108	107.8	05.7	158	157.8	08.3	208	207.7	10.9	258	257.6	13.5
9	09.0	00.5	59	58.9	03.1	109	108.8	05.7	159	158.8	08.3	209	208.7	10.9	259	258.6	13.6
10	10.0	00.5	60	59.9	03.1	110	109.8	05.8	160	159.8	08.4	210	209.7	11.0	260	259.6	13.6
11	11.0	00.6	61	60.9	03.2	111	110.8	05.8	161	160.8	08.4	211	210.7	11.0	261	260.6	13.7
12	12.0	00.6	62	61.9	03.2	112	111.8	05.9	162	161.8	08.5	212	211.7	11.1	262	261.6	13.7
13	13.0	00.7	63	62.9	03.3	113	112.8	05.9	163	162.8	08.5	213	212.7	11.1	263	262.6	13.8
14	14.0	00.7	64	63.9	03.3	114	113.8	06.0	164	163.8	08.6	214	213.7	11.2	264	263.6	13.8
15	15.0	00.8	65	64.6	03.4	115	114.8	06.0	165	164.8	08.6	215	214.7	11.2	265	264.6	13.9
16	16.0	00.8	66	65.9	03.5	116	115.8	06.1	166	165.8	08.7	216	215.7	11.3	266	265.6	13.9
17	17.0	00.9	67	66.9	03.5	117	116.8	06.1	167	166.8	08.7	217	216.7	11.4	267	266.6	14.0
18	18.0	00.9	68	67.9	03.6	118	117.8	06.2	168	167.8	08.8	218	217.7	11.4	268	267.6	14.0
19	19.0	01.0	69	68.9	03.6	119	118.8	06.2	169	168.8	08.8	219	218.7	11.5	269	268.6	14.1
20	20.0	01.0	70	69.9	03.7	120	119.8	06.3	170	169.8	08.9	220	219.7	11.5	270	269.6	14.1
21	21.0	01.1	71	70.9	03.7	121	120.8	06.3	171	170.8	09.0	221	220.7	11.6	271	270.6	14.2
22	22.0	01.1	72	71.9	03.8	122	121.8	06.4	172	171.8	09.0	222	221.7	11.6	272	271.6	14.2
23	23.0	01.2	73	72.9	03.8	123	122.8	06.4	173	172.8	09.1	223	222.7	11.7	273	272.6	14.3
24	24.0	01.3	74	73.9	03.9	124	123.8	06.5	174	173.8	09.1	224	223.7	11.7	274	273.6	14.3
25	25.0	01.3	75	74.9	03.9	125	124.8	06.5	175	174.8	09.2	225	224.7	11.8	275	274.6	14.4
26	26.0	01.4	76	75.9	04.0	126	125.8	06.6	176	175.8	09.2	226	225.7	11.8	276	275.6	14.4
27	27.0	01.4	77	76.9	04.0	127	126.8	06.6	177	176.8	09.3	227	226.7	11.9	277	276.6	14.5
28	28.0	01.5	78	77.9	04.1	128	127.8	06.7	178	177.8	09.3	228	227.7	11.9	278	277.6	14.5
29	29.0	01.5	79	78.9	04.1	129	128.8	06.8	179	178.7	09.4	229	228.7	12.0	279	278.6	14.6
30	30.0	01.6	80	79.9	04.2	130	129.8	06.8	180	179.7	09.4	230	229.7	12.0	280	279.6	14.7
31	31.0	01.6	81	80.9	04.2	131	130.8	06.9	181	180.7	09.5	231	230.7	12.1	281	280.6	14.7
32	32.0	01.7	82	81.9	04.3	132	131.8	07.0	182	181.7	09.5	232	231.7	12.1	282	281.6	14.8
33	33.0	01.7	83	82.9	04.3	133	132.8	07.0	183	182.7	09.6	233	232.7	12.2	283	282.6	14.8
34	34.0	01.8	84	83.9	04.4	134	133.8	07.0	184	183.7	09.6	234	233.7	12.2	284	283.6	14.9
35	35.0	01.8	85	84.9	04.4	135	134.8	07.1	185	184.7	09.7	235	234.7	12.3	285	284.6	14.9
36	35.9	01.9	86	85.9	04.5	136	135.8	07.1	186	185.7	09.7	236	235.7	12.3	286	285.6	15.0
37	36.9	01.9	87	86.9	04.6	137	136.8	07.2	187	186.7	09.8	237	236.7	12.4	287	286.6	15.0
38	37.9	02.0	88	87.9	04.6	138	137.8	07.2	188	187.7	09.8	238	237.7	12.5	288	287.6	15.1
39	38.9	02.0	89	88.9	04.7	139	138.8	07.3	189	188.7	09.9	239	238.7	12.5	289	288.6	15.1
40	39.9	02.1	90	89.9	04.7	140	139.8	07.3	190	189.7	09.9	240	239.7	12.6	290	289.6	15.2
41	40.9	02.1	91	90.9	04.8	141	140.8	07.4	191	190.7	10.0	241	240.7	12.6	291	290.6	15.2
42	41.9	02.2	92	91.9	04.8	142	141.8	07.4	192	191.7	10.0	242	241.7	12.7	292	291.6	15.3
43	42.9	02.2	93	92.9	04.9	143	142.8	07.5	193	192.7	10.1	243	242.7	12.7	293	292.6	15.3
44	43.9	02.3	94	93.9	04.9	144	143.8	07.5	194	193.7	10.1	244	243.7	12.8	294	293.6	15.4
45	44.9	02.4	95	94.9	05.0	145	144.8	07.6	195	194.7	10.2	245	244.7	12.8	295	294.6	15.4
46	45.9	02.4	96	95.9	05.0	146	145.8	07.6	196	195.7	10.3	246	245.7	12.9	296	295.6	15.5
47	46.9	02.5	97	96.9	05.1	147	146.8	07.7	197	196.7	10.3	247	246.7	12.9	297	296.6	15.5
48	47.9	02.5	98	97.9	05.1	148	147.8	07.7	198	197.7	10.4	248	247.7	13.0	298	297.6	15.6
49	48.9	02.6	99	98.9	05.2	149	148.8	07.8	199	198.7	10.4	249	248.7	13.0	299	298.6	15.6
50	49.9	02.6	100	99.9	05.2	150	149.8	07.9	200	199.7	10.5	250	249.7	13.1	300	299.6	15.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 87 Deg.

## Difference of Latitude and Departure for 4 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.9	03.6	101	100.8	07.0	151	150.6	10.5	201	200.5	14.0	251	250.4	17.5
2	02.0	00.1	52	51.9	03.6	102	101.8	07.1	152	151.6	10.6	202	201.5	14.1	252	251.4	17.6
3	03.0	00.2	53	52.9	03.7	103	102.8	07.2	153	152.6	10.7	203	202.5	14.1	253	252.4	17.6
4	04.0	00.3	54	53.9	03.8	104	103.8	07.2	154	153.6	10.7	204	203.5	14.2	254	253.4	17.7
5	05.0	00.3	55	54.9	03.8	105	104.7	07.3	155	154.6	10.8	205	204.5	14.3	255	254.4	17.8
6	06.0	00.4	56	55.9	03.9	106	105.7	07.4	156	155.6	10.9	206	205.5	14.4	256	255.4	17.8
7	07.0	00.5	57	56.9	04.0	107	106.7	07.5	157	156.6	10.9	207	206.5	14.4	257	256.4	17.9
8	08.0	00.6	58	57.9	04.0	108	107.7	07.5	158	157.6	11.0	208	207.5	14.5	258	257.4	18.0
9	09.0	00.6	59	58.9	04.1	109	108.7	07.6	159	158.6	11.1	209	208.5	14.6	259	258.4	18.1
10	10.0	00.7	60	59.9	04.2	110	109.7	07.7	160	159.6	11.2	210	209.5	14.6	260	259.4	18.1
11	11.0	00.8	61	60.9	04.3	111	110.7	07.7	161	160.6	11.2	211	210.5	14.7	261	260.4	18.2
12	12.0	00.8	62	61.9	04.3	112	111.7	07.8	162	161.6	11.3	212	211.5	14.8	262	261.4	18.3
13	13.0	00.9	63	62.8	04.4	113	112.7	07.9	163	162.6	11.4	213	212.5	14.8	263	262.4	18.3
14	14.0	01.0	64	63.8	04.5	114	113.7	07.9	164	163.6	11.4	214	213.5	14.9	264	263.4	18.4
15	15.0	01.0	65	64.8	04.5	115	114.7	08.0	165	164.6	11.5	215	214.5	15.0	265	264.4	18.5
16	16.0	01.1	66	65.8	04.6	116	115.7	08.1	166	165.6	11.6	216	215.5	15.1	266	265.4	18.5
17	17.0	01.2	67	66.8	04.7	117	116.7	08.2	167	166.6	11.6	217	216.5	15.1	267	266.4	18.6
18	18.0	01.3	68	67.8	04.7	118	117.7	08.2	168	167.6	11.7	218	217.5	15.2	268	267.4	18.7
19	19.0	01.3	69	68.8	04.8	119	118.7	08.3	169	168.6	11.8	219	218.5	15.3	269	268.4	18.7
20	20.0	01.4	70	69.8	04.9	120	119.7	08.4	170	169.6	11.8	220	219.5	15.3	270	269.4	18.8
21	20.9	01.5	71	70.8	05.0	121	120.7	08.4	171	170.6	11.9	221	220.5	15.4	271	270.3	18.9
22	21.9	01.5	72	71.8	05.0	122	121.7	08.5	172	171.6	12.0	222	221.5	15.5	272	271.3	19.0
23	22.9	01.6	73	72.8	05.1	123	122.7	08.6	173	172.6	12.1	223	222.5	15.5	273	272.3	19.0
24	23.9	01.7	74	73.8	05.2	124	123.7	08.6	174	173.6	12.1	224	223.5	15.6	274	273.3	19.1
25	24.9	01.7	75	74.8	05.2	125	124.7	08.7	175	174.6	12.2	225	224.5	15.7	275	274.3	19.2
26	25.9	01.8	76	75.8	05.3	126	125.7	08.8	176	175.6	12.3	226	225.5	15.8	276	275.3	19.2
27	26.9	01.9	77	76.8	05.4	127	126.7	08.9	177	176.6	12.3	227	226.5	15.8	277	276.3	19.3
28	27.9	02.0	78	77.8	05.4	128	127.7	08.9	178	177.6	12.4	228	227.5	15.9	278	277.3	19.4
29	28.9	02.0	79	78.8	05.5	129	128.7	09.0	179	178.6	12.5	229	228.5	16.0	279	278.3	19.4
30	29.9	02.1	80	79.8	05.6	130	129.7	09.1	180	179.6	12.5	230	229.4	16.0	280	279.3	19.5
31	30.9	02.2	81	80.8	05.7	131	130.7	09.1	181	180.6	12.6	231	230.4	16.1	281	280.3	19.6
32	31.9	02.2	82	81.8	05.7	132	131.7	09.2	182	181.6	12.7	232	231.4	16.2	282	281.3	19.7
33	32.9	02.3	83	82.8	05.8	133	132.7	09.3	183	182.6	12.8	233	232.4	16.2	283	282.3	19.7
34	33.9	02.4	84	83.8	05.9	134	133.7	09.3	184	183.6	12.8	234	233.4	16.3	284	283.3	19.8
35	34.9	02.4	85	84.8	05.9	135	134.7	09.4	185	184.6	12.9	235	234.4	16.4	285	284.3	19.9
36	35.9	02.5	86	85.8	06.0	136	135.7	09.5	186	185.6	13.0	236	235.4	16.4	286	285.3	19.9
37	36.9	02.6	87	86.8	06.1	137	136.7	09.5	187	186.6	13.0	237	236.4	16.5	287	286.3	20.0
38	37.9	02.7	88	87.8	06.1	138	137.7	09.6	188	187.5	13.1	238	237.4	16.6	288	287.3	20.1
39	38.9	02.7	89	88.8	06.2	139	138.7	09.7	189	188.5	13.2	239	238.4	16.7	289	288.3	20.1
40	39.9	02.8	90	89.8	06.3	140	139.7	09.8	190	189.5	13.2	240	239.4	16.7	290	289.3	20.2
41	40.9	02.9	91	90.8	06.4	141	140.7	09.8	191	190.5	13.3	241	240.4	16.8	291	290.3	20.3
42	41.9	02.9	92	91.8	06.4	142	141.7	09.9	192	191.5	13.4	242	241.4	16.9	292	291.3	20.4
43	42.9	03.0	93	92.8	06.5	143	142.7	10.0	193	192.5	13.5	243	242.4	16.9	293	292.3	20.4
44	43.9	03.1	94	93.8	06.6	144	143.7	10.0	194	193.5	13.5	244	243.4	17.0	294	293.3	20.5
45	44.9	03.1	95	94.8	06.6	145	144.7	10.1	195	194.5	13.6	245	244.4	17.1	295	294.3	20.6
46	45.9	03.2	96	95.8	06.7	146	145.6	10.2	196	195.5	13.7	246	245.4	17.1	296	295.3	20.6
47	46.9	03.3	97	96.8	06.8	147	146.6	10.2	197	196.5	13.7	247	246.4	17.2	297	296.3	20.7
48	47.9	03.4	98	97.8	06.8	148	147.6	10.3	198	197.5	13.8	248	247.4	17.3	298	297.3	20.8
49	48.9	03.4	99	98.8	06.9	149	148.6	10.4	199	198.5	13.9	249	248.4	17.4	299	298.3	20.8
50	49.9	03.5	100	99.8	07.0	150	149.6	10.5	200	199.5	13.9	250	249.4	17.4	300	299.3	20.9
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 86 Deg.



# Difference of Latitude and Departure for 5 Deg.

5

Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep
1	01.0	00.1	51	50.8	04.4	101	100.6	08.8	151	150.4	13.1	201	200.2	17.5	251	250.0	21.8
2	02.0	00.2	52	51.8	04.5	02	101.6	08.9	52	151.4	13.2	02	201.2	17.6	52	251.0	21.9
3	03.0	00.3	53	52.8	04.6	03	102.6	09.0	53	152.4	13.3	03	202.2	17.7	53	252.0	22.0
4	04.0	00.3	54	53.8	04.7	04	103.6	09.0	54	153.4	13.4	04	203.2	17.7	54	253.0	22.1
5	05.0	00.4	55	54.8	04.8	05	104.6	09.1	55	154.4	13.5	05	204.2	17.8	55	254.0	22.2
6	06.0	00.5	56	55.8	04.9	106	105.6	09.2	156	155.4	13.6	206	205.2	17.9	256	255.0	22.3
7	07.0	00.6	57	56.8	05.0	07	106.6	09.3	57	156.4	13.7	07	206.2	18.0	57	256.0	22.4
8	08.0	00.7	58	57.8	05.1	08	107.6	09.4	58	157.4	13.7	08	207.2	18.1	58	257.0	22.4
9	09.0	00.8	59	58.8	05.1	09	108.6	09.5	59	158.4	13.8	09	208.2	18.2	59	258.0	22.5
10	10.0	00.9	60	59.8	05.2	10	109.6	09.6	60	159.4	13.9	10	209.2	18.3	60	259.0	22.6
11	11.0	01.0	61	60.8	05.3	111	110.6	09.7	161	160.4	14.0	211	210.2	18.4	261	260.0	22.7
12	12.0	01.0	62	61.8	05.4	12	111.6	09.7	62	161.4	14.1	12	211.2	18.4	62	261.0	22.8
13	12.9	01.1	63	62.8	05.5	13	112.6	09.8	63	162.4	14.2	13	212.2	18.5	63	262.0	22.9
14	13.9	01.2	64	63.8	05.6	14	113.6	09.9	64	163.4	14.3	14	213.2	18.6	64	263.0	23.0
15	14.9	01.3	65	64.8	05.7	15	114.6	10.0	65	164.4	14.4	15	214.2	18.7	65	264.0	23.1
16	15.9	01.4	66	65.7	05.8	116	115.6	10.1	166	165.4	14.4	216	215.2	18.8	266	265.0	23.1
17	16.9	01.5	67	66.7	05.8	17	116.6	10.2	67	166.4	14.5	17	216.2	18.9	67	266.0	23.2
18	17.9	01.6	68	67.7	05.9	18	117.6	10.3	68	167.4	14.6	18	217.2	19.0	68	267.0	23.3
19	18.9	01.7	69	68.7	06.0	19	118.6	10.4	69	168.4	14.7	19	218.2	19.1	69	268.0	23.4
20	19.9	01.7	70	69.7	06.1	20	119.6	10.4	70	169.4	14.8	20	219.2	19.1	70	269.0	23.5
21	20.9	01.8	71	70.7	06.2	121	120.5	10.5	171	170.4	14.9	221	220.2	19.2	271	270.0	23.6
22	21.9	01.9	72	71.7	06.3	22	121.5	10.6	72	171.3	15.0	22	221.2	19.3	72	271.0	23.7
23	22.9	02.0	73	72.7	06.4	23	122.5	10.7	73	172.3	15.1	23	222.2	19.4	73	272.0	23.8
24	23.9	02.1	74	73.7	06.5	24	123.5	10.8	74	173.3	15.1	24	223.1	19.5	74	273.0	23.8
25	24.9	02.2	75	74.7	06.5	25	124.5	10.9	75	174.3	15.2	25	224.1	19.6	75	274.0	23.9
26	25.9	02.3	76	75.7	06.6	126	125.5	11.0	176	175.3	15.3	226	225.1	19.7	276	275.0	24.0
27	26.9	02.4	77	76.7	06.7	27	126.5	11.0	77	176.3	15.4	27	226.1	19.7	77	275.9	24.1
28	27.9	02.4	78	77.7	06.8	28	127.5	11.1	78	177.3	15.5	28	227.1	19.8	78	276.9	24.2
29	28.9	02.5	79	78.7	06.9	29	128.5	11.2	79	178.3	15.6	29	228.1	19.9	79	277.9	24.3
30	29.9	02.6	80	79.7	07.0	30	129.5	11.3	80	179.3	15.7	30	229.1	20.0	80	278.9	24.4
31	30.9	02.7	81	80.7	07.1	131	130.5	11.4	181	180.3	15.7	231	230.1	20.1	281	279.9	24.4
32	31.9	02.8	82	81.7	07.2	32	131.5	11.5	82	181.3	15.8	32	231.1	20.2	82	280.9	24.5
33	32.9	02.9	83	82.7	07.2	33	132.5	11.6	83	182.3	15.9	33	232.1	20.3	83	281.9	24.6
34	33.9	03.0	84	83.7	07.3	34	133.5	11.7	84	183.3	16.0	34	233.1	20.4	84	282.9	24.7
35	34.9	03.1	85	84.7	07.4	35	134.5	11.7	85	184.3	16.1	35	234.1	20.4	85	283.9	24.8
36	35.9	03.1	86	85.7	07.5	136	135.5	11.8	186	185.3	16.2	236	235.1	20.5	286	284.9	24.9
37	36.9	03.2	87	86.7	07.6	37	136.5	11.9	87	186.3	16.3	37	236.1	20.6	87	285.9	25.0
38	37.9	03.3	88	87.7	07.7	38	137.5	12.0	88	187.3	16.4	38	237.1	20.7	88	286.9	25.1
39	38.9	03.4	89	88.7	07.8	39	138.5	12.1	89	188.3	16.4	39	238.1	20.8	89	287.9	25.1
40	39.8	03.5	90	89.7	07.8	40	139.5	12.2	90	189.3	16.5	40	239.1	20.9	90	288.9	25.2
41	40.8	03.6	91	90.7	07.9	141	140.5	12.3	191	190.3	16.6	241	240.1	21.0	291	289.9	25.3
42	41.8	03.7	92	91.6	08.0	42	141.5	12.4	92	191.3	16.7	42	241.1	21.1	92	290.9	25.4
43	42.8	03.8	93	92.6	08.1	43	142.5	12.4	93	192.3	16.8	43	242.1	21.1	93	291.9	25.5
44	43.8	03.8	94	93.6	08.2	44	143.5	12.5	94	193.3	16.9	44	243.1	21.2	94	292.9	25.6
45	44.8	03.9	95	94.6	08.3	45	144.4	12.6	95	194.3	17.0	45	244.1	21.3	95	293.9	25.7
46	45.8	04.0	96	95.6	08.4	146	145.4	12.7	196	195.3	17.1	246	245.1	21.4	296	294.9	25.8
47	46.8	04.1	97	96.6	08.5	47	146.4	12.8	97	196.3	17.1	47	246.1	21.5	97	295.9	25.8
48	47.8	04.2	98	97.6	08.5	48	147.4	12.9	98	197.2	17.2	48	247.1	21.6	98	296.9	25.9
49	48.8	04.3	99	98.6	08.6	49	148.4	13.0	99	198.2	17.3	49	248.1	21.7	99	297.9	26.0
50	49.8	04.4	100	99.6	08.7	150	149.4	13.1	200	199.2	17.4	250	249.1	21.8	300	298.9	26.1
Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat

D

for 85 Deg.



## Difference of Latitude and Departure for 6 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.7	05.3	101	100.4	10.6	151	150.2	15.8	201	199.9	21.0	251	249.6	26.2
2	02.0	00.2	52	51.7	05.4	02	101.4	10.7	52	151.2	15.9	02	200.9	21.1	52	250.6	26.3
3	03.0	00.3	53	52.7	05.5	03	102.4	10.8	53	152.2	16.0	03	201.9	21.2	53	251.6	26.4
4	04.0	00.4	54	53.7	05.6	04	103.4	10.9	54	153.2	16.1	04	202.9	21.3	54	252.6	26.5
5	05.0	00.5	55	54.7	05.7	05	104.4	11.0	55	154.1	16.2	05	203.9	21.4	55	253.6	26.6
6	06.0	00.6	56	55.7	05.9	106	105.4	11.1	156	155.1	16.3	206	204.9	21.5	256	254.6	26.8
7	07.0	00.7	57	56.7	06.0	07	106.4	11.2	57	156.1	16.4	07	205.9	21.6	57	255.6	26.9
8	08.0	00.8	58	57.7	06.1	08	107.4	11.3	58	157.1	16.5	08	206.9	21.7	58	256.6	27.0
9	08.9	00.9	59	58.7	06.2	09	108.4	11.4	59	158.1	16.6	09	207.9	21.8	59	257.6	27.1
10	09.9	01.0	60	59.7	06.3	10	109.4	11.5	60	159.1	16.7	10	208.8	21.9	60	258.6	27.2
11	10.9	01.1	61	60.7	06.4	111	110.4	11.6	161	160.1	16.8	211	209.8	22.0	261	259.6	27.3
12	11.9	01.3	62	61.7	06.5	12	111.4	11.7	62	161.1	16.9	12	210.8	22.2	62	260.6	27.4
13	12.9	01.4	63	62.7	06.6	13	112.4	11.8	63	162.1	17.0	13	211.8	22.3	63	261.6	27.5
14	13.9	01.5	64	63.6	06.7	14	113.4	11.9	64	163.1	17.1	14	212.8	22.4	64	262.5	27.6
15	14.9	01.6	65	64.6	06.8	15	114.4	12.0	65	164.1	17.2	15	213.8	22.5	65	263.5	27.7
16	15.9	01.7	66	65.6	06.9	116	115.4	12.1	166	165.1	17.3	216	214.8	22.6	266	264.5	27.8
17	16.9	01.8	67	66.6	07.0	17	116.4	12.2	67	166.1	17.5	17	215.8	22.7	67	265.5	27.9
18	17.9	01.9	68	67.6	07.1	18	117.4	12.3	68	167.1	17.6	18	216.8	22.8	68	266.5	28.0
19	18.9	02.0	69	68.6	07.2	19	118.3	12.4	69	168.1	17.7	19	217.8	22.9	69	267.5	28.1
20	19.9	02.1	70	69.6	07.3	20	119.3	12.5	70	169.1	17.8	20	218.8	23.0	70	268.5	28.2
21	20.9	02.2	71	70.6	07.4	21	120.3	12.6	71	170.1	17.9	21	219.8	23.1	71	269.5	28.3
22	21.9	02.3	72	71.6	07.5	22	121.3	12.7	72	171.1	18.0	22	220.8	23.2	72	270.5	28.4
23	22.9	02.4	73	72.6	07.6	23	122.3	12.9	73	172.0	18.1	23	221.8	23.3	73	271.5	28.5
24	23.9	02.5	74	73.6	07.7	24	123.3	13.0	74	173.0	18.2	24	222.8	23.4	74	272.5	28.6
25	24.9	02.6	75	74.6	07.8	25	124.3	13.1	75	174.0	18.3	25	223.8	23.5	75	273.5	28.7
26	25.9	02.7	76	75.6	07.9	26	125.3	13.2	76	175.0	18.4	26	224.8	23.6	76	274.5	28.8
27	26.9	02.8	77	76.6	08.0	27	126.3	13.3	77	176.0	18.5	27	225.8	23.7	77	275.5	28.9
28	27.8	02.9	78	77.6	08.1	28	127.3	13.4	78	177.0	18.6	28	226.7	23.8	78	276.5	29.1
29	28.8	03.0	79	78.6	08.2	29	128.3	13.5	79	178.0	18.7	29	227.7	23.9	79	277.5	29.2
30	29.8	03.1	80	79.6	08.4	30	129.3	13.6	80	179.0	18.8	30	228.7	24.0	80	278.5	29.3
31	30.8	03.2	81	80.6	08.5	31	130.3	13.7	81	180.0	18.9	31	229.7	24.1	81	279.5	29.4
32	31.8	03.3	82	81.5	08.6	32	131.3	13.8	82	181.0	19.0	32	230.7	24.2	82	280.4	29.5
33	32.8	03.4	83	82.5	08.7	33	132.3	13.9	83	182.0	19.1	33	231.7	24.3	83	281.4	29.6
34	33.8	03.6	84	83.5	08.8	34	133.3	14.0	84	183.0	19.2	34	232.7	24.5	84	282.4	29.7
35	34.8	03.7	85	84.5	08.9	35	134.3	14.1	85	184.0	19.3	35	233.7	24.6	85	283.4	29.8
36	35.8	03.8	86	85.5	09.0	36	135.3	14.2	86	185.0	19.4	36	234.7	24.7	86	284.4	29.9
37	36.8	03.9	87	86.5	09.1	37	136.3	14.3	87	186.0	19.5	37	235.7	24.8	87	285.4	30.0
38	37.8	04.0	88	87.5	09.2	38	137.2	14.4	88	187.0	19.6	38	236.7	24.9	88	286.4	30.1
39	38.8	04.1	89	88.5	09.3	39	138.2	14.5	89	188.0	19.8	39	237.7	25.0	89	287.4	30.2
40	39.8	04.2	90	89.5	09.4	40	139.2	14.6	90	189.0	19.9	40	238.7	25.1	90	288.4	30.3
41	40.8	04.3	91	90.5	09.5	41	140.2	14.7	91	189.9	20.0	41	239.7	25.2	91	289.4	30.4
42	41.8	04.4	92	91.5	09.6	42	141.2	14.8	92	190.9	20.1	42	240.7	25.3	92	290.4	30.5
43	42.8	04.5	93	92.5	09.7	43	142.2	14.9	93	191.9	20.2	43	241.7	25.4	93	291.4	30.6
44	43.8	04.6	94	93.5	09.8	44	143.2	15.0	94	192.9	20.3	44	242.7	25.5	94	292.4	30.7
45	44.8	04.7	95	94.5	09.9	45	144.2	15.2	95	193.9	20.4	45	243.7	25.6	95	293.4	30.8
46	45.7	04.8	96	95.5	10.0	46	145.2	15.3	96	194.9	20.5	46	244.6	25.7	96	294.4	30.9
47	46.7	04.9	97	96.5	10.1	47	146.2	15.4	97	195.9	20.6	47	245.6	25.8	97	295.4	31.0
48	47.7	05.0	98	97.5	10.2	48	147.2	15.5	98	196.9	20.7	48	246.6	25.9	98	296.4	31.1
49	48.7	05.1	99	98.5	10.3	49	148.2	15.6	99	197.9	20.8	49	247.6	26.0	99	297.4	31.2
50	49.7	05.2	100	99.5	10.5	50	149.2	15.7	100	198.9	20.9	50	248.6	26.1	100	298.4	31.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 84 Deg.

# Difference of Latitude and Departure for 7 Deg.

7

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.6	06.2	101	100.2	12.3	151	149.9	18.4	201	199.5	24.5	251	249.1	30.6
2	02.0	00.2	52	51.6	06.3	02	101.2	12.4	52	150.9	18.5	02	200.5	24.6	52	250.1	30.7
3	03.0	00.4	53	52.6	06.5	03	102.2	12.5	53	151.9	18.6	03	201.5	24.7	53	251.1	30.8
4	04.0	00.5	54	53.6	06.6	04	103.2	12.7	54	152.8	18.7	04	202.5	24.8	54	252.1	30.9
5	05.0	00.6	55	54.6	06.7	05	104.2	12.8	55	153.8	18.9	05	203.5	25.0	55	253.1	31.0
6	06.0	00.7	56	55.6	06.8	106	105.2	12.9	156	154.8	19.0	206	204.5	25.1	256	254.1	31.2
7	06.9	00.9	57	56.6	06.9	07	106.2	13.0	57	155.8	19.1	07	205.4	25.2	57	255.1	31.3
8	07.9	01.0	58	57.6	07.1	08	107.2	13.1	58	156.8	19.2	08	206.4	25.3	58	256.1	31.4
9	08.9	01.1	59	58.6	07.2	09	108.2	13.3	59	157.8	19.4	09	207.4	25.4	59	257.1	31.5
10	09.9	01.2	60	59.6	07.3	10	109.2	13.4	60	158.8	19.5	10	208.4	25.6	60	258.1	31.7
11	10.9	01.3	61	60.5	07.4	111	110.2	13.5	161	159.8	19.6	211	209.4	25.7	261	259.0	31.8
12	11.9	01.5	62	61.5	07.5	12	111.2	13.6	62	160.8	19.7	12	210.4	25.8	62	260.0	31.9
13	12.9	01.6	63	62.5	07.7	13	112.2	13.8	63	161.8	19.8	13	211.4	25.9	63	261.0	32.0
14	13.9	01.7	64	63.5	07.8	14	113.1	13.9	64	162.8	20.0	14	212.4	26.1	64	262.0	32.1
15	14.9	01.8	65	64.5	07.9	15	114.1	14.0	65	163.8	20.1	15	213.4	26.2	65	263.0	32.3
16	15.9	01.9	66	65.5	08.0	116	115.1	14.1	166	164.8	20.2	216	214.4	26.3	266	264.0	32.4
17	16.9	02.1	67	66.5	08.2	17	116.1	14.2	67	165.7	20.3	17	215.4	26.4	67	265.0	32.5
18	17.9	02.2	68	67.5	08.3	18	117.1	14.4	68	166.7	20.5	18	216.4	26.5	68	266.0	32.6
19	18.9	02.3	69	68.5	08.4	19	118.1	14.5	69	167.7	20.6	19	217.4	26.7	69	267.0	32.8
20	19.9	02.4	70	69.5	08.5	20	119.1	14.6	70	168.7	20.7	20	218.4	26.8	70	268.0	32.9
21	20.8	02.6	71	70.5	08.6	21	120.1	14.7	71	169.7	20.8	21	219.3	26.9	71	269.0	33.0
22	21.8	02.7	72	71.5	08.8	22	121.1	14.9	72	170.7	20.9	22	220.3	27.0	72	270.0	33.1
23	22.8	02.8	73	72.5	08.9	23	122.1	15.0	73	171.7	21.1	23	221.3	27.2	73	271.0	33.2
24	23.8	02.9	74	73.4	09.0	24	123.1	15.1	74	172.7	21.2	24	222.3	27.3	74	271.9	33.4
25	24.8	03.0	75	74.4	09.1	25	124.1	15.2	75	173.7	21.3	25	223.3	27.4	75	272.9	33.5
26	25.8	03.2	76	75.4	09.3	26	125.1	15.3	76	174.7	21.4	26	224.3	27.5	76	273.9	33.6
27	26.8	03.3	77	76.4	09.4	27	126.0	15.5	77	175.7	21.6	27	225.3	27.6	77	274.9	33.7
28	27.8	03.4	78	77.4	09.5	28	127.0	15.6	78	176.7	21.7	28	226.3	27.8	78	275.9	33.9
29	28.8	03.5	79	78.4	09.6	29	128.0	15.7	79	177.7	21.8	29	227.3	27.9	79	276.9	34.0
30	29.8	03.7	80	79.4	09.7	30	129.0	15.8	80	178.7	21.9	30	228.3	28.0	80	277.9	34.1
31	30.8	03.8	81	80.4	09.9	31	130.0	16.0	81	179.6	22.0	31	229.3	28.1	81	278.9	34.2
32	31.8	03.9	82	81.4	10.0	32	131.0	16.1	82	180.6	22.2	32	230.3	28.3	82	279.9	34.3
33	32.8	04.0	83	82.4	10.1	33	132.0	16.2	83	181.6	22.3	33	231.3	28.4	83	280.9	34.5
34	33.7	04.1	84	83.4	10.2	34	133.0	16.3	84	182.6	22.4	34	232.2	28.5	84	281.9	34.6
35	34.7	04.3	85	84.4	10.4	35	134.0	16.4	85	183.6	22.5	35	233.2	28.6	85	282.9	34.7
36	35.7	04.4	86	85.4	10.5	36	135.0	16.6	86	184.6	22.7	36	234.2	28.7	86	283.9	34.8
37	36.7	04.5	87	86.3	10.6	37	136.0	16.7	87	185.6	22.8	37	235.2	28.9	87	284.8	34.9
38	37.7	04.6	88	87.3	10.7	38	137.0	16.8	88	186.6	22.9	38	236.2	29.0	88	285.8	35.1
39	38.7	04.8	89	88.3	10.8	39	138.0	16.9	89	187.6	23.0	39	237.2	29.1	89	286.8	35.2
40	39.7	04.9	90	89.3	11.0	40	139.0	17.1	90	188.6	23.1	40	238.2	29.2	90	287.8	35.3
41	40.7	05.0	91	90.3	11.1	41	139.9	17.2	91	189.6	23.3	41	239.2	29.3	91	288.8	35.4
42	41.7	05.1	92	91.3	11.2	42	140.9	17.3	92	190.6	23.4	42	240.2	29.5	92	289.8	35.5
43	42.7	05.2	93	92.3	11.3	43	141.9	17.4	93	191.6	23.5	43	241.2	29.6	93	290.8	35.7
44	43.7	05.4	94	93.3	11.5	44	142.9	17.5	94	192.5	23.6	44	242.2	29.7	94	291.8	35.8
45	44.7	05.5	95	94.3	11.6	45	143.9	17.7	95	193.5	23.7	45	243.2	29.8	95	292.8	35.9
46	45.7	05.6	96	95.3	11.7	46	144.9	17.8	96	194.5	23.9	46	244.2	29.9	96	293.8	36.0
47	46.6	05.7	97	96.3	11.8	47	145.9	17.9	97	195.5	24.0	47	245.2	30.1	97	294.8	36.2
48	47.6	05.8	98	97.3	11.9	48	146.9	18.0	98	196.5	24.1	48	246.2	30.2	98	295.8	36.3
49	48.6	06.0	99	98.3	12.1	49	147.9	18.1	99	197.5	24.2	49	247.2	30.3	99	296.8	36.4
50	49.6	06.1	100	99.3	12.2	50	148.9	18.5	100	198.5	24.3	50	248.2	30.4	100	297.8	36.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 83 Deg.



# 8 Difference of Latitude and Departure for 8 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.5	07.1	101	100.0	14.1	151	149.5	21.0	201	199.1	28.0	251	248.6	34.9
2	03.0	00.3	52	51.5	07.2	02	101.0	14.2	52	150.5	21.2	02	200.0	28.1	52	249.6	35.1
3	03.0	00.4	53	52.5	07.4	03	102.0	14.3	53	151.5	21.3	03	201.0	28.3	53	250.5	35.2
4	04.0	00.6	54	53.5	07.5	04	103.0	14.5	54	152.5	21.4	04	202.0	28.4	54	251.5	35.4
5	05.0	00.7	55	54.5	07.7	05	104.0	14.6	55	153.5	21.6	05	203.0	28.5	55	252.5	35.5
6	05.9	00.8	56	55.5	07.8	106	105.0	14.8	156	154.5	21.7	206	204.0	28.7	256	253.5	35.6
7	06.9	01.0	57	56.4	07.9	07	106.0	14.9	57	155.5	21.9	07	205.0	28.8	57	254.5	35.8
8	07.9	01.1	58	57.4	08.1	08	107.0	15.0	58	156.5	22.0	08	206.0	29.0	58	255.5	35.9
9	08.9	01.3	59	58.4	08.2	09	107.9	15.2	59	157.5	22.1	09	207.0	29.1	59	256.5	36.1
10	09.9	01.4	60	59.4	08.4	10	108.9	15.3	60	158.4	22.3	10	208.0	29.2	60	257.5	36.2
11	10.9	01.5	61	60.4	08.5	111	109.9	15.5	161	159.4	22.4	211	209.0	29.4	261	258.5	36.3
12	11.9	01.7	62	61.4	08.6	12	110.9	15.6	62	160.4	22.6	12	209.9	29.5	62	259.5	36.5
13	12.9	01.8	63	62.4	08.8	13	111.9	15.7	63	161.4	22.7	13	210.9	29.6	63	260.4	36.6
14	13.9	01.9	64	63.4	08.9	14	112.9	15.9	64	162.4	22.8	14	211.9	29.8	64	261.4	36.7
15	14.9	02.1	65	64.4	09.0	15	113.9	16.0	65	163.4	23.0	15	212.9	29.9	65	262.4	36.9
16	15.8	02.2	66	65.4	09.2	116	114.9	16.1	166	164.4	23.1	216	213.9	30.1	266	263.4	37.0
17	16.8	02.4	67	66.4	09.3	17	115.9	16.3	67	165.4	23.2	17	214.9	30.2	67	264.4	37.2
18	17.8	02.5	68	67.3	09.5	18	116.9	16.4	68	166.4	23.4	18	215.9	30.3	68	265.4	37.3
19	18.8	02.6	69	68.3	09.6	19	117.8	16.6	69	167.4	23.5	19	216.9	30.5	69	266.4	37.4
20	19.8	02.8	70	69.3	09.7	20	118.8	16.7	70	168.4	23.7	20	217.9	30.6	70	267.4	37.6
21	20.8	02.9	71	70.3	09.9	121	119.8	16.8	171	169.4	23.8	221	218.9	30.8	271	268.4	37.7
22	21.8	03.1	72	71.3	10.0	22	120.8	17.0	72	170.3	23.9	22	219.8	30.9	72	269.4	37.9
23	22.8	03.2	73	72.3	10.2	23	121.8	17.1	73	171.3	24.1	23	220.8	31.0	73	270.4	38.0
24	23.8	03.3	74	73.3	10.3	24	122.8	17.3	74	172.3	24.2	24	221.8	31.2	74	271.3	38.1
25	24.8	03.5	75	74.3	10.4	25	123.8	17.4	75	173.3	24.4	25	222.8	31.3	75	272.3	38.3
26	25.7	03.6	76	75.3	10.6	126	124.8	17.5	176	174.3	24.5	226	223.8	31.5	276	273.3	38.4
27	26.7	03.8	77	76.3	10.7	27	125.8	17.7	77	175.3	24.6	27	224.8	31.6	77	274.3	38.6
28	27.7	03.9	78	77.2	10.9	28	126.8	17.8	78	176.3	24.8	28	225.8	31.7	78	275.3	38.7
29	28.7	04.0	79	78.2	11.0	29	127.7	18.0	79	177.3	24.9	29	226.8	31.9	79	276.3	38.8
30	29.7	04.2	80	79.2	11.1	30	128.7	18.1	80	178.3	25.1	30	227.8	32.0	80	277.3	39.0
31	30.7	04.3	81	80.2	11.3	131	129.7	18.2	181	179.2	25.2	231	228.8	32.2	281	278.3	39.1
32	31.7	04.5	82	81.2	11.4	32	130.7	18.4	82	180.2	25.3	32	229.7	32.3	82	279.3	39.3
33	32.7	04.6	83	82.2	11.6	33	131.7	18.5	83	181.2	25.5	33	230.7	32.4	83	280.3	39.4
34	33.7	04.7	84	83.2	11.7	34	132.7	18.7	84	182.2	25.6	34	231.7	32.6	84	281.2	39.5
35	34.7	04.9	85	84.2	11.8	35	133.7	18.8	85	183.2	25.8	35	232.7	32.7	85	282.2	39.7
36	35.7	05.0	86	85.2	12.0	136	134.7	18.9	186	184.2	25.9	236	233.7	32.9	286	283.2	39.8
37	36.6	05.2	87	86.2	12.1	37	135.7	19.1	87	185.2	26.0	37	234.7	33.0	87	284.2	40.0
38	37.6	05.3	88	87.1	12.2	38	136.7	19.2	88	186.2	26.2	38	235.7	33.1	88	285.2	40.1
39	38.6	05.4	89	88.1	12.4	39	137.7	19.3	89	187.2	26.3	39	236.7	33.3	89	286.2	40.2
40	39.6	05.6	90	89.1	12.5	40	138.6	19.5	90	188.2	26.4	40	237.7	33.4	90	287.2	40.4
41	40.6	05.7	91	90.1	12.7	141	139.6	19.6	191	189.1	26.6	241	238.7	33.5	291	288.2	40.5
42	41.6	05.8	92	91.1	12.8	42	140.6	19.8	92	190.1	26.7	42	239.7	33.7	92	289.2	40.6
43	42.6	06.0	93	92.1	12.9	43	141.6	19.9	93	191.1	26.9	43	240.6	33.8	93	290.2	40.8
44	43.6	06.1	94	93.1	13.1	44	142.6	20.0	94	192.1	27.0	44	241.6	34.0	94	291.1	40.9
45	44.6	06.3	95	94.1	13.2	45	143.6	20.2	95	193.1	27.1	45	242.6	34.1	95	292.1	41.1
46	45.6	06.4	96	95.1	13.4	146	144.6	20.3	196	194.1	27.3	246	243.6	34.2	296	293.1	41.2
47	46.5	06.5	97	96.1	13.5	47	145.6	20.5	97	195.1	27.4	47	244.6	34.4	97	294.1	41.3
48	47.5	06.7	98	97.0	13.6	48	146.6	20.6	98	196.1	27.6	48	245.6	34.5	98	295.1	41.5
49	48.5	06.8	99	98.0	13.8	49	147.6	20.7	99	197.1	27.7	49	246.6	34.7	99	296.1	41.6
50	49.5	07.0	100	99.0	13.9	150	148.5	20.9	200	198.1	27.8	250	247.6	34.8	300	297.1	41.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 89 Deg.



# Difference of Latitude and Departure for 9 Deg.

9

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	01.0	00.2	51	50.4	08.0	101	99.8	15.8	151	149.1	23.6	201	198.5	31.4	251	247.9	39.3
2	02.0	00.3	52	51.4	08.1	02	100.7	16.0	52	150.1	23.8	02	199.5	31.6	52	248.9	39.4
3	03.0	00.5	53	52.3	08.3	03	101.7	16.1	53	151.1	23.9	03	200.5	31.7	53	249.9	39.6
4	04.0	00.6	54	53.3	08.4	04	102.7	16.3	54	152.1	24.1	04	201.5	31.9	54	250.9	39.7
5	04.9	00.8	55	54.3	08.6	05	103.7	16.4	55	153.1	24.2	05	202.5	32.1	55	251.9	39.9
6	05.9	00.9	56	55.3	08.8	06	104.7	16.6	56	154.1	24.4	06	203.5	32.2	56	252.9	40.0
7	06.9	01.1	57	56.3	08.9	07	105.7	16.7	57	155.1	24.6	07	204.5	32.4	57	253.8	40.2
8	07.9	01.3	58	57.3	09.1	08	106.7	16.9	58	156.1	24.7	08	205.4	32.5	58	254.8	40.4
9	08.9	01.4	59	58.3	09.2	09	107.7	17.0	59	157.0	24.9	09	206.4	32.7	59	255.8	40.5
10	09.9	01.6	60	59.3	09.4	10	108.6	17.2	60	158.0	25.0	10	207.4	32.8	60	256.8	40.7
11	10.9	01.7	61	60.2	09.5	11	109.6	17.4	61	159.0	25.2	11	208.4	33.0	61	257.8	40.8
12	11.9	01.9	62	61.2	09.7	12	110.6	17.5	62	160.0	25.3	12	209.4	33.2	62	258.8	41.0
13	12.8	02.0	63	62.2	09.9	13	111.6	17.7	63	161.0	25.5	13	210.4	33.3	63	259.8	41.1
14	13.8	02.2	64	63.2	10.0	14	112.6	17.8	64	162.0	25.6	14	211.4	33.5	64	260.8	41.3
15	14.8	02.3	65	64.2	10.2	15	113.6	18.0	65	163.0	25.8	15	212.4	33.6	65	261.7	41.4
16	15.8	02.5	66	65.2	10.3	16	114.6	18.1	66	164.0	26.0	16	213.3	33.8	66	262.7	41.6
17	16.8	02.7	67	66.2	10.5	17	115.6	18.3	67	164.9	26.1	17	214.3	33.9	67	263.7	41.8
18	17.8	02.8	68	67.2	10.6	18	116.5	18.5	68	165.9	26.3	18	215.3	34.1	68	264.7	41.9
19	18.8	03.0	69	68.2	10.8	19	117.5	18.6	69	166.9	26.4	19	216.3	34.3	69	265.7	42.1
20	19.8	03.1	70	69.1	10.9	20	118.5	18.8	70	167.9	26.6	20	217.3	34.4	70	266.7	42.2
21	20.7	03.3	71	70.1	11.1	21	119.5	18.9	71	168.9	26.7	21	218.3	34.6	71	267.7	42.4
22	21.7	03.4	72	71.1	11.3	22	120.5	19.1	72	169.9	26.9	22	219.3	34.7	72	268.7	42.5
23	22.7	03.6	73	72.1	11.4	23	121.5	19.2	73	170.9	27.1	23	220.3	34.9	73	269.6	42.7
24	23.7	03.8	74	73.1	11.6	24	122.5	19.4	74	171.9	27.2	24	221.3	35.0	74	270.6	42.9
25	24.7	03.9	75	74.1	11.7	25	123.5	19.6	75	172.8	27.4	25	222.2	35.2	75	271.6	43.0
26	25.7	04.1	76	75.1	11.9	26	124.5	19.7	76	173.8	27.5	26	223.2	35.3	76	272.6	43.2
27	26.7	04.2	77	76.1	12.0	27	125.4	19.9	77	174.8	27.7	27	224.2	35.5	77	273.6	43.3
28	27.7	04.4	78	77.0	12.2	28	126.4	20.0	78	175.8	27.8	28	225.2	35.7	78	274.6	43.5
29	28.6	04.5	79	78.0	12.4	29	127.4	20.2	79	176.8	28.0	29	226.2	35.8	79	275.6	43.6
30	29.6	04.7	80	79.0	12.5	30	128.4	20.3	80	177.8	28.2	30	227.2	36.0	80	276.6	43.8
31	30.6	04.8	81	80.0	12.7	31	129.4	20.5	81	178.8	28.3	31	228.2	36.1	81	277.5	43.9
32	31.6	05.0	82	81.0	12.8	32	130.4	20.6	82	179.8	28.5	32	229.1	36.3	82	278.5	44.1
33	32.6	05.2	83	82.0	13.0	33	131.4	20.8	83	180.7	28.6	33	230.1	36.4	83	279.5	44.3
34	33.6	05.3	84	83.0	13.1	34	132.4	21.0	84	181.7	28.8	34	231.1	36.6	84	280.5	44.4
35	34.6	05.5	85	84.0	13.3	35	133.3	21.1	85	182.7	28.9	35	232.1	36.8	85	281.5	44.6
36	35.6	05.6	86	84.9	13.5	36	134.3	21.3	86	183.7	29.1	36	233.1	36.9	86	282.5	44.7
37	36.5	05.8	87	85.9	13.6	37	135.3	21.4	87	184.7	29.2	37	234.1	37.1	87	283.5	44.9
38	37.5	05.9	88	86.9	13.8	38	136.3	21.6	88	185.7	29.4	38	235.1	37.2	88	284.5	45.0
39	38.5	06.1	89	87.9	13.9	39	137.3	21.7	89	186.7	29.6	39	236.1	37.4	89	285.4	45.2
40	39.5	06.3	90	88.9	14.1	40	138.3	21.9	90	187.7	29.7	40	237.0	37.5	90	286.4	45.4
41	40.5	06.4	91	89.9	14.2	41	139.3	22.1	91	188.7	29.9	41	238.0	37.7	91	287.4	45.5
42	41.5	06.6	92	90.9	14.4	42	140.3	22.2	92	189.6	30.0	42	239.0	37.8	92	288.4	45.7
43	42.5	06.7	93	91.9	14.5	43	141.2	22.4	93	190.6	30.2	43	240.0	38.0	93	289.4	45.8
44	43.5	06.9	94	92.9	14.7	44	142.2	22.5	94	191.6	30.3	44	241.0	38.2	94	290.4	46.0
45	44.4	07.0	95	93.8	14.9	45	143.2	22.7	95	192.6	30.5	45	242.0	38.3	95	291.4	46.1
46	45.4	07.2	96	94.8	15.0	46	144.2	22.8	96	193.6	30.7	46	243.0	38.5	96	292.4	46.3
47	46.4	07.4	97	95.8	15.2	47	145.2	23.0	97	194.6	30.8	47	244.0	38.6	97	293.3	46.5
48	47.4	07.5	98	96.8	15.3	48	146.2	23.1	98	195.6	31.0	48	244.9	38.8	98	294.3	46.6
49	48.4	07.7	99	97.8	15.5	49	147.2	23.3	99	196.6	31.1	49	245.9	38.9	99	295.3	46.8
50	49.4	07.8	100	98.8	15.6	50	148.2	23.5	100	197.5	31.3	50	246.9	39.1	100	296.3	46.9
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

E

for 81 Deg.

# 10 Difference of Latitude and Departure for 10 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	50.2	08.8	101	99.5	17.5	151	148.7	26.2	201	197.9	34.9	251	247.2	43.5
2	02.0	00.3	52	51.2	09.0	02	100.4	17.7	52	149.7	26.4	02	198.9	35.0	52	248.2	43.7
3	03.0	00.5	53	52.2	09.2	03	101.4	17.9	53	150.7	26.5	03	199.9	35.2	53	249.2	43.9
4	03.9	00.7	54	53.2	09.4	04	102.4	18.0	54	151.7	26.7	04	200.9	35.4	54	250.1	44.0
5	04.9	00.9	55	54.2	09.5	05	103.4	18.2	55	152.6	26.9	05	201.9	35.5	55	251.1	44.2
6	05.9	01.0	56	55.1	09.7	106	104.4	18.4	156	153.6	27.1	206	202.9	35.7	256	252.1	44.4
7	06.9	01.2	57	56.1	09.9	07	105.4	18.6	57	154.6	27.2	07	203.9	35.9	57	253.1	44.6
8	07.9	01.4	58	57.1	10.1	08	106.4	18.7	58	155.6	27.4	08	204.8	36.1	58	254.1	44.7
9	08.9	01.6	59	58.1	10.2	09	107.3	18.9	59	156.6	27.6	09	205.8	36.2	59	255.1	44.9
10	09.8	01.7	60	59.1	10.4	10	108.3	19.1	60	157.6	27.7	10	206.8	36.4	60	256.0	45.1
11	10.8	01.9	61	60.1	10.6	111	109.3	19.2	161	158.0	27.9	211	207.8	36.6	261	257.0	45.3
12	11.8	02.1	62	61.1	10.8	12	110.3	19.4	62	159.5	28.1	12	208.8	36.8	62	258.0	45.4
13	12.8	02.3	63	62.0	10.9	13	111.3	19.6	63	160.5	28.3	13	209.8	36.9	63	259.0	45.6
14	13.8	02.4	64	63.0	11.1	14	112.3	19.8	64	161.5	28.4	14	210.7	37.1	64	260.0	45.8
15	14.8	02.6	65	64.0	11.2	15	113.3	19.9	65	162.5	28.6	15	211.7	37.3	65	261.0	46.0
16	15.8	02.8	66	65.0	11.4	116	114.2	20.1	166	163.5	28.8	216	212.7	37.5	266	262.0	46.1
17	16.7	02.9	67	66.0	11.6	17	115.2	20.3	67	164.5	29.0	17	213.7	37.6	67	262.9	46.3
18	17.7	03.1	68	67.0	11.8	18	116.2	20.5	68	165.4	29.1	18	214.7	37.8	68	263.9	46.5
19	18.7	03.3	69	68.0	12.0	19	117.2	20.6	69	166.4	29.3	19	215.7	38.0	69	264.9	46.6
20	19.7	03.5	70	68.9	12.1	20	118.2	20.8	70	167.4	29.5	20	216.7	38.1	70	265.9	46.8
21	20.7	03.6	71	69.9	12.3	21	119.2	21.0	171	168.4	29.7	221	217.6	38.3	271	266.9	47.0
22	21.7	03.8	72	70.9	12.5	22	120.1	21.2	72	169.4	29.8	22	218.6	38.5	72	267.9	47.2
23	22.7	04.0	73	71.9	12.7	23	121.1	21.3	73	170.4	30.0	23	219.6	38.7	73	268.8	47.3
24	23.6	04.2	74	72.9	12.8	24	122.1	21.5	74	171.4	30.2	24	220.6	38.8	74	269.8	47.5
25	24.6	04.3	75	73.9	13.0	25	123.1	21.7	75	172.3	30.3	25	221.6	39.0	75	270.8	47.7
26	25.6	04.5	76	74.8	13.2	26	124.1	21.8	176	173.3	30.5	226	222.6	39.2	276	271.8	47.9
27	26.6	04.7	77	75.8	13.4	27	125.1	22.0	77	174.3	30.7	27	223.5	39.4	77	272.8	48.0
28	27.6	04.9	78	76.8	13.5	28	126.1	22.2	78	175.3	30.9	28	224.5	39.5	78	273.8	48.2
29	28.6	05.0	79	77.8	13.7	29	127.0	22.4	79	176.3	31.0	29	225.5	39.7	79	274.8	48.4
30	29.5	05.2	80	78.8	13.9	30	128.0	22.5	80	177.3	31.2	30	226.5	39.9	80	275.7	48.6
31	30.5	05.4	81	79.8	14.0	31	129.0	22.7	181	178.2	31.4	231	227.5	40.1	281	276.7	48.7
32	31.5	05.5	82	80.8	14.2	32	130.0	22.9	82	179.2	31.6	32	228.5	40.2	82	277.7	48.9
33	32.5	05.7	83	81.7	14.4	33	131.0	23.1	83	180.2	31.7	33	229.5	40.4	83	278.7	49.1
34	33.5	05.9	84	82.7	14.6	34	132.0	23.2	84	181.2	31.9	34	230.4	40.6	84	279.7	49.2
35	34.5	06.1	85	83.7	14.7	35	132.9	23.4	85	182.2	32.1	35	231.4	40.7	85	280.7	49.4
36	35.5	06.2	86	84.7	14.9	36	133.9	23.6	186	183.2	32.3	236	232.4	40.9	286	281.6	49.6
37	36.4	06.4	87	85.7	15.1	37	134.9	23.8	87	184.2	32.4	37	233.4	41.1	87	282.6	49.8
38	37.4	06.6	88	86.7	15.3	38	135.9	23.9	88	185.1	32.6	38	234.4	41.3	88	283.6	49.9
39	38.4	06.8	89	87.6	15.4	39	136.9	24.1	89	186.1	32.8	39	235.4	41.4	89	284.6	50.1
40	39.4	06.9	90	88.6	15.6	40	137.9	24.3	90	187.1	32.1	40	236.3	41.6	90	285.6	50.3
41	40.4	07.1	91	89.6	15.8	41	138.9	24.4	191	188.1	33.1	241	237.3	42.8	291	286.6	50.5
42	41.4	07.3	92	90.6	16.0	42	139.8	24.6	92	189.1	33.3	42	238.3	42.0	92	287.6	50.6
43	42.3	07.5	93	91.6	16.1	43	140.8	24.8	93	190.1	33.5	43	239.3	42.1	93	288.5	50.8
44	43.3	07.6	94	92.6	16.3	44	141.8	25.0	94	191.0	33.6	44	240.3	42.3	94	289.5	51.0
45	44.3	07.8	95	93.6	16.5	45	142.8	25.1	95	192.0	33.8	45	241.3	42.5	95	290.5	51.2
46	45.3	07.0	96	94.5	16.6	46	143.8	25.3	196	193.0	34.0	246	242.3	42.7	296	291.5	51.3
47	46.3	08.1	97	95.5	16.8	47	144.8	25.5	97	194.0	34.2	47	243.2	42.8	97	292.5	51.5
48	47.3	08.3	98	96.5	17.0	48	145.7	25.7	98	195.0	34.3	48	244.2	43.0	98	293.5	51.7
49	48.3	08.5	99	97.5	17.2	49	146.7	25.8	99	196.0	34.5	49	245.2	43.2	99	294.5	52.8
50	49.2	08.7	100	98.5	17.3	150	147.7	26.0	200	197.0	34.7	250	246.2	43.4	300	295.4	52.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 80 Deg.



# Difference of Latitude and Departure for 11 Deg. 11

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	50.1	09.7	101	99.1	19.3	151	148.2	28.8	201	197.3	38.4	251	246.4	47.9
2	02.0	00.4	52	51.0	09.9	02	100.1	19.5	52	149.2	29.0	02	198.3	38.5	52	247.4	48.1
3	02.6	00.6	53	52.0	10.1	03	101.1	19.7	53	150.2	29.2	03	199.3	38.7	53	248.3	48.3
4	03.9	00.8	54	53.0	10.3	04	102.1	19.8	54	151.2	29.4	04	200.2	38.9	54	249.3	48.5
5	04.9	01.0	55	54.0	10.5	05	103.1	20.0	55	152.1	29.6	05	201.2	39.1	55	250.3	48.7
6	05.9	01.1	56	55.0	10.7	106	104.0	20.2	156	153.1	29.8	206	202.2	39.2	256	251.3	48.8
7	06.9	01.3	57	56.0	10.9	07	105.0	20.4	57	154.1	30.0	07	203.2	39.5	57	252.3	49.0
8	07.9	01.5	58	56.0	11.1	08	106.0	20.6	58	155.1	30.1	08	204.2	39.7	58	253.2	49.2
9	08.8	01.7	59	57.9	11.3	09	107.0	20.8	59	156.1	30.3	09	205.2	39.9	59	254.2	49.4
10	09.8	01.9	60	58.0	11.4	10	108.0	21.0	60	157.1	30.5	10	206.1	40.1	60	255.2	49.6
11	10.8	02.1	61	59.0	11.6	111	109.9	21.2	161	158.0	30.7	211	207.1	40.3	261	256.2	49.8
12	11.8	02.3	62	60.9	11.8	12	109.9	21.4	62	159.0	30.9	12	208.1	40.4	62	257.2	50.0
13	12.8	02.5	63	61.8	12.0	13	110.9	21.6	63	160.0	31.1	13	209.1	40.6	63	258.2	50.2
14	13.7	02.7	64	62.8	12.2	14	111.9	21.8	64	161.0	31.3	14	210.1	40.8	64	259.1	50.4
15	14.7	02.9	65	63.8	12.4	15	112.9	21.9	65	162.0	31.5	15	211.0	41.0	65	260.1	50.6
16	15.7	03.0	66	64.8	12.6	116	113.9	22.1	166	162.9	31.7	216	212.0	41.2	266	261.1	51.8
17	16.7	03.2	67	65.8	12.8	17	114.8	22.3	67	163.9	31.9	17	213.0	41.4	67	262.1	50.9
18	17.7	03.4	68	66.7	13.0	18	115.8	22.5	68	164.9	32.1	18	214.0	41.6	68	263.1	51.1
19	18.7	03.6	69	67.7	13.2	19	116.8	22.7	69	165.9	32.2	19	215.0	41.8	69	264.0	51.3
20	19.6	03.8	70	68.7	13.4	20	117.8	22.9	70	166.9	32.4	20	215.9	42.0	70	265.0	51.5
21	20.6	04.1	71	69.7	13.5	121	118.8	23.1	171	167.9	32.6	221	216.9	42.2	271	266.0	51.7
22	21.6	04.2	72	70.7	13.7	22	119.8	23.3	72	168.8	32.8	22	217.9	42.4	72	267.0	51.9
23	22.6	04.4	73	71.7	13.9	23	120.7	23.5	73	169.8	33.0	23	218.9	42.5	73	268.0	52.1
24	23.6	04.6	74	72.6	14.1	24	121.7	23.7	74	170.8	33.2	24	219.9	42.7	74	269.0	52.3
25	24.5	04.8	75	73.6	14.3	25	122.7	23.9	75	171.8	33.4	25	220.9	42.9	75	269.9	52.5
26	25.5	05.0	76	74.6	14.5	126	123.7	24.0	176	172.8	33.6	226	221.8	43.1	276	270.9	52.7
27	26.5	05.2	77	75.6	14.7	27	124.7	24.2	77	173.7	33.8	27	222.8	43.3	77	271.9	52.9
28	27.5	05.3	78	76.6	14.9	28	125.6	24.4	78	174.7	34.0	28	223.8	43.5	78	272.9	53.0
29	28.5	05.5	79	77.5	15.1	29	126.6	24.6	79	175.7	34.2	29	224.8	43.7	79	273.9	53.2
30	29.4	05.7	80	78.5	15.3	30	127.6	24.8	80	176.7	34.3	30	225.8	43.9	80	274.8	53.4
31	30.4	05.9	81	79.5	15.5	131	128.6	25.0	181	177.7	34.5	231	226.7	44.1	281	275.8	53.6
32	31.4	06.1	82	80.5	15.6	32	129.6	25.2	82	178.6	34.7	32	227.7	44.3	82	276.8	53.8
33	32.4	06.3	83	81.5	15.8	33	130.6	25.4	83	179.6	34.9	33	228.7	44.5	83	277.8	54.0
34	33.4	06.5	84	82.5	16.0	34	131.5	25.6	84	180.6	35.1	34	229.7	44.6	84	278.8	54.2
35	34.4	06.7	85	83.4	16.2	35	132.5	25.8	85	181.6	35.3	35	230.7	44.8	85	279.8	54.4
36	35.3	06.9	86	84.4	16.4	136	133.5	25.9	186	182.6	35.5	236	231.7	45.0	286	280.7	54.6
37	36.3	07.1	87	85.4	16.6	37	134.5	26.1	87	183.6	35.7	37	232.6	45.2	87	281.7	54.8
38	37.3	07.3	88	86.4	16.8	38	135.5	26.3	88	184.5	35.9	38	233.6	45.4	88	282.7	55.0
39	38.3	07.4	89	87.4	17.0	39	136.4	26.5	89	185.5	36.1	39	234.6	45.6	89	283.7	55.1
40	39.3	07.6	90	88.3	17.2	40	137.4	26.7	90	186.5	36.3	40	235.6	45.8	90	284.7	55.3
41	40.2	07.8	91	89.3	17.4	141	138.4	26.9	191	187.5	36.4	241	236.6	46.0	291	285.6	55.5
42	41.2	08.0	92	90.3	17.6	42	139.4	27.1	92	188.5	36.6	42	237.5	46.2	92	286.6	55.7
43	42.2	08.2	93	91.3	17.7	43	140.4	27.3	93	189.4	36.8	43	238.5	46.4	93	287.6	55.9
44	43.2	08.4	94	92.3	17.9	44	141.3	27.5	94	190.4	37.0	44	239.5	46.6	94	288.6	56.0
45	44.2	08.6	95	93.3	18.1	45	142.3	27.7	95	191.4	37.2	45	240.5	46.7	95	289.6	56.3
46	45.2	08.8	96	94.2	18.3	146	143.3	27.9	196	192.4	37.4	246	241.5	47.0	296	290.5	56.5
47	46.1	09.0	97	95.2	18.5	47	144.3	28.0	97	193.4	37.6	47	242.5	47.1	97	291.5	56.7
48	47.1	09.2	98	96.2	18.7	48	145.3	28.2	98	194.4	37.8	48	243.4	47.3	98	292.5	56.9
49	48.1	09.3	99	97.2	18.9	49	146.3	28.4	99	195.4	38.0	49	244.4	47.5	99	293.5	57.0
50	49.1	09.5	100	98.2	19.1	150	147.2	28.6	200	196.3	38.2	250	245.4	47.7	300	294.5	57.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 79 Deg.



## Difference of Latitude and Departure for 21 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.9	10.6	101	98.8	21.0	151	147.7	31.4	201	196.6	41.8	251	245.5	52.2
2	02.0	00.4	52	50.9	10.8	02	99.8	21.2	52	148.7	31.6	02	197.6	42.0	52	246.5	52.4
3	02.9	00.6	53	51.8	11.0	03	100.7	21.4	53	149.6	31.8	03	198.5	42.2	53	247.4	52.6
4	03.9	00.8	54	52.8	11.2	04	101.7	21.6	54	150.6	32.0	04	199.5	42.4	54	248.4	52.8
5	04.9	01.0	55	53.8	11.4	05	102.7	21.8	55	151.6	32.2	05	200.5	42.6	55	249.4	53.0
6	05.9	01.2	56	54.8	11.6	06	103.7	22.0	56	152.6	32.4	06	201.5	42.8	56	250.4	53.2
7	06.8	01.5	57	55.7	11.9	07	104.6	22.3	57	153.5	32.7	07	202.4	43.1	57	251.3	53.5
8	07.8	01.7	58	56.7	12.1	08	105.6	22.5	58	154.5	32.9	08	203.4	43.3	58	252.3	53.7
9	08.8	01.9	59	57.7	12.3	09	106.6	22.7	59	155.5	33.1	09	204.4	43.5	59	253.3	53.9
10	09.8	02.1	60	58.7	12.5	10	107.6	22.9	60	156.5	33.3	10	205.4	43.7	60	254.3	54.1
11	10.8	02.3	61	59.7	12.7	11	108.6	23.1	61	157.5	33.5	11	206.4	43.9	61	255.3	54.3
12	11.7	02.5	62	60.6	12.9	12	109.5	23.3	62	158.4	33.7	12	207.3	44.1	62	256.2	54.5
13	12.7	02.7	63	61.6	13.1	13	110.5	23.5	63	159.4	33.9	13	208.3	44.3	63	257.2	54.7
14	13.7	02.9	64	62.6	13.3	14	111.5	23.7	64	160.4	34.1	14	209.3	44.5	64	258.2	54.9
15	14.7	03.1	65	63.6	13.5	15	112.5	23.9	65	161.4	34.3	15	210.3	44.7	65	259.2	55.1
16	15.6	03.3	66	64.5	13.7	16	113.4	24.1	66	162.3	34.5	16	211.2	44.9	66	260.1	55.3
17	16.6	03.5	67	65.5	13.9	17	114.4	24.3	67	163.3	34.7	17	212.2	45.1	67	261.1	55.5
18	17.6	03.7	68	66.5	14.1	18	115.4	24.5	68	164.3	34.9	18	213.2	45.3	68	262.1	55.7
19	18.6	04.0	69	67.5	14.4	19	116.4	24.8	69	165.3	35.2	19	214.2	45.6	69	263.1	56.0
20	19.6	04.2	70	68.5	14.6	20	117.4	25.0	70	166.3	35.4	20	215.2	45.8	70	264.1	56.2
21	20.5	04.4	71	69.4	14.8	21	118.3	25.2	71	167.2	35.6	21	216.1	46.0	71	265.0	56.4
22	21.5	04.6	72	70.4	15.0	22	119.3	25.4	72	168.2	35.8	22	217.1	46.2	72	266.0	56.6
23	22.5	04.8	73	71.4	15.2	23	120.3	25.6	73	169.2	36.0	23	218.1	46.4	73	267.0	56.8
24	23.5	05.0	74	72.4	15.4	24	121.3	25.8	74	170.2	36.2	24	219.1	46.6	74	268.0	57.0
25	24.5	05.2	75	73.4	15.6	25	122.3	26.0	75	171.2	36.4	25	220.1	46.8	75	269.0	57.2
26	25.4	05.4	76	74.3	15.8	26	123.2	26.2	76	172.1	36.6	26	221.0	47.0	76	269.9	57.4
27	26.4	05.6	77	75.3	16.0	27	124.2	26.4	77	173.1	36.8	27	222.0	47.2	77	270.9	57.6
28	27.4	05.8	78	76.3	16.2	28	125.2	26.6	78	174.1	37.0	28	223.0	47.4	78	271.9	57.8
29	28.4	06.0	79	77.3	16.4	29	126.2	26.8	79	175.1	37.2	29	224.0	47.6	79	272.9	58.0
30	29.3	06.2	80	78.2	16.6	30	127.1	27.0	80	176.0	37.4	30	224.9	47.8	80	273.8	58.2
31	30.3	06.4	81	79.2	16.8	31	128.1	27.2	81	177.0	37.6	31	225.9	48.0	81	274.8	58.4
32	31.3	06.7	82	80.2	17.1	32	129.1	27.5	82	178.0	37.9	32	226.9	48.3	82	275.8	58.7
33	32.3	06.9	83	81.2	17.3	33	130.1	27.7	83	179.0	38.1	33	227.9	48.5	83	276.8	58.9
34	33.3	07.1	84	82.2	17.5	34	131.1	27.9	84	180.0	38.3	34	228.9	48.7	84	277.8	59.1
35	34.2	07.3	85	83.1	17.7	35	132.0	28.1	85	180.9	38.5	35	229.8	48.9	85	278.7	59.3
36	35.2	07.5	86	84.1	17.9	36	133.0	28.3	86	181.9	38.7	36	230.8	49.1	86	279.7	59.5
37	36.2	07.7	87	85.1	18.0	37	134.0	28.5	87	182.9	38.9	37	231.8	49.3	87	280.7	59.7
38	37.2	07.9	88	86.1	18.3	38	135.0	28.7	88	183.9	39.1	38	232.8	49.5	88	281.7	59.9
39	38.1	08.1	89	87.0	18.5	39	135.9	28.9	89	184.8	39.3	39	233.7	49.7	89	282.6	60.1
40	39.1	08.3	90	88.0	18.7	40	136.9	29.1	90	185.8	39.5	40	234.7	49.9	90	283.6	60.3
41	40.1	08.5	91	89.0	18.9	41	137.9	29.3	91	186.8	39.7	41	235.7	50.1	91	284.6	60.5
42	41.1	08.7	92	90.0	19.1	42	138.9	29.5	92	187.8	39.9	42	236.7	50.3	92	285.6	60.7
43	42.1	08.9	93	91.0	19.3	43	139.9	30.7	93	188.8	40.1	43	237.7	50.5	93	286.6	60.9
44	43.0	09.2	94	91.9	19.6	44	140.8	30.0	94	189.7	40.4	44	238.6	50.8	94	287.5	61.2
45	44.0	09.4	95	92.9	19.8	45	141.8	30.2	95	190.7	40.6	45	239.6	51.0	95	288.5	61.4
46	45.0	09.6	96	93.9	20.0	46	142.8	30.4	96	191.7	40.8	46	240.6	51.2	96	289.5	61.6
47	46.0	09.8	97	94.9	20.2	47	143.8	30.6	97	192.7	41.0	47	241.6	51.4	97	290.5	61.8
48	46.9	10.0	98	95.8	20.4	48	144.7	30.8	98	193.6	41.2	48	242.5	51.6	98	291.4	62.0
49	47.9	10.2	99	96.8	20.6	49	145.7	31.0	99	194.6	41.4	49	243.5	51.8	99	292.4	62.2
50	48.9	10.4	100	97.8	20.8	50	146.7	31.2	100	195.6	41.6	50	244.5	52.0	100	293.4	62.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 78 Deg.

# Difference of Latitude and Departure for 13 Deg.

13

Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep
1	01.0	00.2	51	49.7	11.5	101	98.4	22.7	151	147.1	34.0	201	195.9	45.2	251	244.6	56.5
2	01.9	00.4	52	50.7	11.7	02	99.4	22.9	52	148.1	34.2	02	196.8	45.4	52	245.5	56.7
3	02.9	00.7	53	51.6	11.9	03	100.4	23.2	53	149.1	34.4	03	197.8	45.7	53	246.5	56.9
4	03.9	00.9	54	52.6	12.1	04	101.3	23.4	54	150.1	34.6	04	198.8	45.9	54	247.5	57.1
5	04.9	01.1	55	53.6	12.4	05	102.3	23.6	55	151.0	34.9	05	199.7	46.1	55	248.5	57.4
6	05.8	01.3	56	54.6	12.6	06	103.3	23.8	156	152.0	35.1	206	200.7	46.3	256	249.4	57.6
7	06.8	01.6	57	55.5	12.8	07	104.3	24.1	57	153.0	35.3	07	201.7	46.6	57	250.4	57.8
8	07.8	01.8	58	56.5	13.0	08	105.2	24.3	58	154.0	35.5	08	202.7	46.8	58	251.4	58.0
9	08.8	02.0	59	57.5	13.3	09	106.2	24.5	59	154.9	35.8	09	203.6	47.0	59	252.4	58.3
10	09.7	02.2	60	58.5	13.5	10	107.2	24.7	60	155.9	36.0	10	204.6	47.2	60	253.3	58.5
11	10.7	02.5	61	59.4	13.7	11	108.2	25.0	161	156.9	36.2	211	205.6	47.5	261	254.3	58.7
12	11.7	04.7	62	60.4	13.9	12	109.1	25.1	62	157.9	36.4	12	206.6	47.7	62	255.3	58.9
13	12.7	02.9	63	61.4	14.2	13	110.1	25.4	63	158.8	36.7	13	207.5	47.9	63	256.3	59.2
14	13.6	03.1	64	62.4	14.4	14	111.1	25.6	64	159.8	36.9	14	208.5	48.1	64	257.2	59.4
15	14.6	03.4	65	63.3	14.6	15	112.1	25.9	65	160.8	37.1	15	209.5	48.4	65	258.2	59.6
16	15.6	03.6	66	64.3	14.8	16	113.0	26.1	166	161.7	37.3	216	210.5	48.6	266	259.2	59.8
17	16.6	03.8	67	65.3	15.1	17	114.0	26.3	67	162.7	37.6	17	211.4	48.8	67	260.2	60.1
18	17.5	04.0	68	66.2	15.3	18	115.0	26.5	68	163.7	37.8	18	212.4	49.0	68	261.1	60.3
19	18.5	04.3	69	67.2	15.5	19	116.0	26.8	69	164.7	38.0	19	213.4	49.3	69	262.1	60.5
20	19.5	04.5	70	68.2	15.7	20	116.9	27.0	70	165.6	38.2	20	214.4	49.5	70	263.1	60.7
21	20.5	04.7	71	69.2	16.0	21	117.9	27.2	171	166.6	38.5	221	215.3	49.7	271	264.1	61.0
22	21.4	04.9	72	70.2	16.2	22	118.9	27.4	72	167.6	38.7	22	216.3	49.9	72	265.0	61.2
23	22.4	05.2	73	71.1	16.4	23	119.8	27.7	73	168.6	38.9	23	217.3	50.2	73	266.0	61.4
24	23.4	05.4	74	72.1	16.6	24	120.8	27.9	74	169.5	39.1	24	218.3	50.4	74	267.0	61.6
25	24.4	05.6	75	73.1	16.9	25	121.8	28.1	75	170.5	39.4	25	219.2	50.6	75	268.0	61.9
26	25.3	05.8	76	74.1	17.1	26	122.8	28.3	176	171.5	39.6	226	220.2	50.8	276	268.9	62.1
27	26.3	06.1	77	75.0	17.3	27	123.7	28.6	77	172.5	39.8	27	221.2	51.1	77	269.9	62.3
28	27.3	06.3	78	76.0	17.5	28	124.7	28.8	78	173.4	40.0	28	222.2	51.3	78	270.9	62.5
29	28.3	06.5	79	77.0	17.8	29	125.7	29.0	79	174.4	40.3	29	223.1	51.5	79	271.9	62.8
30	29.2	06.7	80	78.0	18.0	30	126.7	29.2	80	175.4	40.5	30	224.1	51.7	80	272.8	63.0
31	30.2	07.0	81	78.9	18.2	31	127.6	29.5	181	176.4	40.7	231	225.1	52.0	281	273.8	63.2
32	31.2	07.2	82	79.9	18.4	32	128.6	29.7	82	177.3	40.9	32	226.1	52.2	82	274.8	63.4
33	32.2	07.4	83	80.9	18.7	33	129.6	29.9	83	178.3	41.2	33	227.0	52.4	83	275.8	63.7
34	33.1	07.6	84	81.8	18.9	34	130.6	30.1	84	179.3	41.4	34	228.0	52.6	84	276.7	63.9
35	34.1	07.9	85	82.8	19.1	35	131.5	30.4	85	180.3	41.6	35	229.0	52.9	85	277.7	64.1
36	35.1	08.1	86	83.8	19.3	36	132.5	30.6	186	181.2	41.8	236	230.0	53.1	286	278.7	64.3
37	36.1	08.3	87	84.8	19.6	37	133.5	30.8	87	182.2	42.1	37	230.9	53.3	87	279.6	64.6
38	37.0	08.5	88	85.7	19.8	38	134.5	31.0	88	183.2	42.3	38	231.9	53.5	88	280.6	64.8
39	38.0	08.8	89	86.7	20.0	39	135.4	31.3	89	184.2	42.5	39	232.9	53.8	89	281.6	65.0
40	39.0	09.0	90	87.7	20.2	40	136.4	31.5	90	185.1	42.7	40	233.9	54.0	90	282.6	65.2
41	39.9	09.2	91	88.7	20.5	41	137.4	31.7	191	186.1	43.0	241	234.8	54.2	291	283.5	65.5
42	40.9	09.4	92	89.6	20.7	42	138.4	31.9	92	187.1	43.2	42	235.8	54.4	92	284.5	65.7
43	41.9	09.7	93	90.6	20.9	43	139.3	32.2	93	188.1	43.4	43	236.8	54.7	93	285.5	65.9
44	42.9	09.9	94	91.6	21.1	44	140.3	32.4	94	189.0	43.6	44	237.8	54.9	94	286.5	66.1
45	43.8	10.1	95	92.6	21.4	45	141.3	32.6	95	190.0	43.9	45	238.7	55.1	95	287.4	66.4
46	44.8	10.3	96	93.5	21.6	46	142.3	32.8	196	191.0	44.1	246	239.7	55.3	296	288.4	66.6
47	45.8	10.6	97	94.5	21.8	47	143.2	33.1	97	192.0	44.3	47	240.7	55.6	97	289.4	66.8
48	46.8	10.8	98	95.5	22.0	48	144.2	33.3	98	192.9	44.5	48	241.6	55.8	98	290.4	67.0
49	47.7	11.0	99	96.5	22.3	49	145.2	33.5	99	193.9	44.8	49	242.6	56.0	99	291.3	67.3
50	48.7	11.2	100	97.4	22.5	150	146.2	33.7	200	194.9	45.0	250	243.6	56.2	300	292.3	67.5
Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat

F

for 77 Deg.



14 Difference of Latitude and Departure for 14 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.5	12.3	101	98.0	24.4	151	146.5	36.5	201	195.0	48.6	251	243.5	60.7
2	01.9	00.5	52	50.5	12.6	02	99.0	24.7	52	147.5	36.8	02	196.0	48.9	52	244.5	61.0
3	02.9	00.7	53	51.4	12.8	03	99.9	24.9	53	148.5	37.0	03	197.0	49.1	53	245.5	61.2
4	03.5	01.0	54	52.4	13.1	04	100.9	25.2	54	149.4	37.3	04	197.9	49.4	54	246.4	61.5
5	04.9	01.2	55	53.4	13.3	05	101.9	25.4	55	150.4	37.5	05	198.9	49.6	55	247.4	61.7
6	05.8	01.5	56	54.3	13.6	06	102.8	25.7	56	151.4	37.7	06	199.9	49.9	56	248.4	62.0
7	06.8	01.7	57	55.3	13.8	07	103.8	25.9	57	152.3	38.0	07	200.8	50.1	57	249.4	62.2
8	07.8	01.9	58	56.3	14.0	08	104.8	26.1	58	153.3	38.2	08	201.8	50.3	58	250.3	62.4
9	08.7	02.2	59	57.2	14.3	09	105.8	26.4	59	154.3	38.5	09	202.8	50.6	59	251.3	62.7
10	09.7	02.4	60	58.2	14.5	10	106.7	26.6	60	155.2	38.7	10	203.8	50.8	60	252.3	62.9
11	10.7	02.7	61	59.2	14.8	11	107.7	26.9	61	156.2	39.0	11	204.7	51.1	61	253.2	63.2
12	11.6	02.9	62	60.2	15.0	12	108.7	27.1	62	157.2	39.2	12	205.7	51.3	62	254.2	63.4
13	12.6	03.1	63	61.1	15.2	13	109.6	27.3	63	158.2	39.4	13	206.7	51.5	63	255.2	63.6
14	13.6	03.4	64	62.1	15.5	14	110.6	27.6	64	159.1	39.7	14	207.6	51.8	64	256.2	63.9
15	14.6	03.6	65	63.1	15.7	15	111.6	27.8	65	160.1	39.9	15	208.6	52.0	65	257.1	64.1
16	15.5	03.9	66	64.0	16.0	16	112.6	28.1	66	161.1	40.2	16	209.6	52.3	66	258.1	64.4
17	16.5	04.1	67	65.0	16.2	17	113.5	28.3	67	162.0	40.4	17	210.5	52.5	67	259.1	64.6
18	17.5	04.4	68	66.0	16.5	18	114.5	28.6	68	163.0	40.7	18	211.5	52.8	68	260.0	64.9
19	18.4	04.6	69	66.9	16.7	19	115.5	28.8	69	164.0	40.9	19	212.5	53.0	69	261.0	65.1
20	19.4	04.8	70	67.9	16.9	20	116.4	29.0	70	164.9	41.1	20	213.5	53.2	70	262.0	65.3
21	20.4	05.1	71	68.9	17.2	21	117.4	29.3	71	165.9	41.4	21	214.4	53.5	71	262.9	65.6
22	21.3	05.3	72	69.9	17.2	22	118.4	29.5	72	166.9	41.6	22	215.4	53.7	72	263.9	65.8
23	22.3	05.6	73	70.8	17.7	23	119.3	29.8	73	167.9	41.9	23	216.4	54.0	73	264.9	66.1
24	23.3	05.8	74	71.8	17.9	24	120.3	30.0	74	168.8	42.1	24	217.3	54.2	74	265.9	66.3
25	24.3	06.0	75	72.8	18.1	25	121.3	30.2	75	169.8	42.3	25	218.3	54.4	75	266.8	66.5
26	25.2	06.3	76	73.7	18.4	26	122.3	30.5	76	170.8	42.6	26	219.3	54.7	76	267.8	66.8
27	26.2	06.5	77	74.7	18.6	27	123.2	30.7	77	171.7	42.8	27	220.3	54.9	77	268.8	67.0
28	27.2	06.8	78	75.7	18.9	28	124.2	31.0	78	172.7	43.1	28	221.2	55.2	78	269.7	67.3
29	28.1	07.0	79	76.7	19.1	29	125.2	31.2	79	173.7	43.3	29	222.2	55.4	79	270.7	67.5
30	29.1	07.3	80	77.6	19.4	30	126.1	31.5	80	174.6	43.6	30	223.2	55.7	80	271.7	67.8
31	30.1	07.5	81	78.6	19.6	31	127.1	31.7	81	175.6	43.8	31	224.1	55.9	81	272.6	68.0
32	31.0	07.7	82	79.6	19.8	32	128.1	31.9	82	176.6	44.0	32	225.1	56.1	82	273.6	68.2
33	32.0	08.0	83	80.5	20.1	33	129.0	32.2	83	177.6	44.3	33	226.1	56.4	83	274.6	68.5
34	33.0	08.2	84	81.5	20.3	34	130.0	32.4	84	178.5	44.5	34	227.0	56.6	84	275.6	68.7
35	34.0	08.5	85	82.5	20.6	35	131.0	32.7	85	179.5	44.8	35	228.0	56.9	85	276.5	69.0
36	34.9	08.7	86	83.4	20.8	36	132.0	32.9	86	180.5	45.0	36	229.0	57.1	86	277.5	69.2
37	35.9	09.0	87	84.4	21.1	37	132.9	33.2	87	181.4	45.3	37	230.0	57.4	87	278.5	69.5
38	36.9	09.2	88	85.4	21.3	38	133.9	33.4	88	182.4	45.5	38	230.9	57.6	88	279.4	69.7
39	37.8	09.4	89	86.4	21.5	39	134.9	33.6	89	183.4	45.7	39	231.9	57.8	89	280.4	69.9
40	38.8	09.7	90	87.3	21.8	40	135.8	33.9	90	184.4	46.0	40	232.9	58.1	90	281.4	70.2
41	39.8	09.9	91	88.3	22.0	41	136.8	34.1	91	185.3	46.2	41	233.8	58.3	91	282.3	70.4
42	40.8	10.2	92	89.3	22.3	42	137.8	34.4	92	186.3	46.5	42	234.8	58.6	92	283.3	70.7
43	41.7	10.4	93	90.2	22.5	43	138.7	34.6	93	187.3	46.7	43	235.8	58.8	93	284.3	70.9
44	42.7	10.6	94	91.2	22.7	44	139.7	34.8	94	188.2	46.9	44	236.7	59.0	94	285.3	71.1
45	43.7	10.9	95	92.2	23.0	45	140.7	35.1	95	189.2	47.2	45	237.7	59.3	95	286.2	71.4
46	44.6	11.1	96	93.1	23.2	46	141.7	35.3	96	190.2	47.4	46	238.7	59.5	96	287.2	71.6
47	45.6	11.4	97	94.1	23.5	47	142.6	35.6	97	191.1	47.7	47	239.7	59.8	97	288.2	71.9
48	46.6	11.6	98	95.1	23.7	48	143.6	35.8	98	192.1	47.9	48	240.6	60.0	98	289.1	72.1
49	47.5	11.9	99	96.1	24.0	49	144.6	36.1	99	193.1	48.2	49	241.6	60.3	99	290.1	72.4
50	48.5	12.1	100	97.0	24.2	50	145.5	36.3	100	194.1	48.4	50	242.6	60.5	100	291.1	72.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 76 Deg.



# Difference of Latitude and Departure for 15 Deg.

15

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	49.3	13.2	101	97.6	26.1	151	145.8	39.1	201	194.1	52.0	251	242.4	65.0
2	01.9	00.5	52	50.2	13.5	02	98.5	26.4	52	146.8	39.3	02	195.1	52.3	52	243.4	65.2
3	02.9	00.8	53	51.2	13.7	03	99.5	26.7	53	147.8	39.6	03	196.1	52.5	53	244.4	65.5
4	03.9	01.0	54	52.2	14.0	04	100.5	26.9	54	148.7	39.9	04	197.0	52.8	54	245.3	65.7
5	04.8	01.3	55	53.1	14.2	05	101.4	27.2	55	149.7	40.1	05	198.0	53.1	55	246.3	66.0
6	05.8	01.6	56	54.1	14.5	106	102.4	27.4	156	150.7	40.4	206	199.0	53.3	256	247.3	66.3
7	06.8	01.8	57	55.1	14.8	07	103.4	27.7	57	151.6	40.6	07	199.9	53.6	57	248.2	66.5
8	07.7	02.1	58	56.0	15.0	08	104.3	28.0	58	152.6	40.9	08	200.9	53.8	58	249.2	66.8
9	08.7	02.3	59	57.0	15.3	09	105.3	28.2	59	153.6	41.1	09	201.9	54.1	59	250.2	67.0
10	09.7	02.6	60	58.0	15.5	10	106.2	28.5	60	154.5	41.4	10	202.8	54.3	60	251.1	67.3
11	10.6	02.8	61	58.9	15.8	111	107.2	28.7	161	155.5	41.7	211	203.8	54.6	261	252.1	67.5
12	11.6	03.1	62	59.9	16.0	12	108.2	29.0	62	156.5	41.9	12	204.8	54.9	62	253.1	67.8
13	12.6	03.4	63	60.9	16.3	13	109.1	29.2	63	157.4	42.2	13	205.7	55.1	63	254.0	68.1
14	13.5	03.6	64	61.8	16.6	14	110.1	29.5	64	158.4	42.4	14	206.7	55.4	64	255.0	68.3
15	14.5	03.9	65	62.8	16.8	15	111.1	29.8	65	159.4	42.7	15	207.7	55.6	65	256.0	68.6
16	15.5	04.1	66	63.7	17.1	116	112.0	30.0	166	160.3	43.0	216	208.6	55.9	266	256.9	68.8
17	16.4	04.4	67	64.7	17.3	17	113.0	30.3	67	161.3	43.2	17	209.6	56.1	67	257.9	69.1
18	17.4	04.7	68	65.7	17.6	18	114.0	30.5	68	162.3	43.5	18	210.6	56.4	68	258.9	69.4
19	18.4	04.9	69	66.6	17.9	19	114.9	30.8	69	163.2	43.7	19	211.5	56.7	69	259.8	69.6
20	19.3	05.2	70	67.6	18.1	20	115.9	31.1	70	164.2	44.0	20	212.5	56.9	70	260.8	69.9
21	20.3	05.4	71	68.6	18.4	121	116.9	31.3	171	165.2	44.3	221	213.5	57.2	271	261.8	70.1
22	21.2	05.7	72	69.5	18.6	22	117.8	31.6	72	166.1	44.5	22	214.4	57.5	72	262.7	70.4
23	22.2	06.0	73	70.5	18.9	23	118.8	31.8	73	167.1	44.8	23	215.4	57.7	73	263.7	70.7
24	23.2	06.2	74	71.5	19.2	24	119.8	32.1	74	168.1	45.0	24	216.4	58.0	74	264.7	70.9
25	24.1	06.5	75	72.4	19.4	25	120.7	32.4	75	169.0	45.3	25	217.3	58.2	75	265.6	71.2
26	25.1	06.7	76	73.4	19.7	126	121.7	32.6	176	170.0	45.5	226	218.3	58.5	276	266.6	71.4
27	26.1	07.0	77	74.4	19.9	27	122.7	32.9	77	171.0	45.8	27	219.3	58.7	77	267.6	71.7
28	27.0	07.2	78	75.3	20.2	28	123.6	33.1	78	171.9	46.1	28	220.2	59.0	78	268.5	71.9
29	28.0	07.5	79	76.3	20.4	29	124.6	33.4	79	172.9	46.3	29	221.2	59.3	79	269.5	72.2
30	29.0	07.8	80	77.3	20.7	30	125.6	33.6	80	173.9	46.6	30	222.2	59.5	80	270.5	72.5
31	29.9	08.0	81	78.2	21.0	131	126.5	33.9	181	174.8	46.8	231	223.1	59.8	281	271.4	72.7
32	30.9	08.3	82	79.2	21.2	32	127.5	34.2	82	175.8	47.1	32	224.1	60.0	82	272.4	73.0
33	31.9	08.5	83	80.2	21.5	33	128.5	34.4	83	176.8	47.4	33	225.1	60.3	83	273.4	73.2
34	32.8	08.8	84	81.1	21.7	34	129.4	34.7	84	177.7	47.6	34	226.0	60.6	84	274.3	73.5
35	33.8	09.1	85	82.1	22.0	35	130.4	34.9	85	178.7	47.9	35	227.0	60.8	85	275.3	73.8
36	34.8	09.3	86	83.1	22.3	136	131.4	35.2	186	179.7	48.1	236	228.0	61.1	286	276.2	74.0
37	35.7	09.6	87	84.0	22.5	37	132.3	35.5	87	180.6	48.4	37	228.9	61.3	87	277.2	74.3
38	36.7	09.8	88	85.0	22.8	38	133.3	35.7	88	181.6	48.7	38	229.9	61.6	88	278.2	74.5
39	37.7	10.1	89	86.0	23.0	39	134.3	36.0	89	182.6	48.9	39	230.9	61.9	89	279.1	74.8
40	38.6	10.4	90	86.9	23.3	40	135.2	36.2	90	183.5	49.2	40	231.8	62.1	90	280.1	75.0
41	39.6	10.6	91	87.9	23.6	141	136.2	36.5	191	184.5	49.4	241	232.8	62.4	291	281.1	75.3
42	40.6	10.9	92	88.9	23.8	42	137.2	36.7	92	185.5	49.7	42	233.7	62.6	92	282.0	75.6
43	41.5	11.1	93	89.8	24.1	43	138.1	37.0	93	186.4	49.9	43	234.7	62.9	93	283.0	75.8
44	42.5	11.4	94	90.8	24.3	44	139.1	37.3	94	187.4	50.2	44	235.7	63.1	94	284.0	76.1
45	43.5	11.6	95	91.8	24.6	45	140.1	37.5	95	188.4	50.5	45	236.6	63.4	95	284.9	76.3
46	44.4	11.9	96	92.7	24.8	146	141.0	37.8	196	189.3	50.7	246	237.6	63.7	296	285.9	76.6
47	45.4	12.2	97	93.7	25.1	47	142.0	38.0	97	190.3	51.0	47	238.6	63.9	97	286.9	76.9
48	46.4	12.4	98	94.7	25.4	48	143.0	38.3	98	191.2	51.2	48	239.5	64.1	98	287.8	77.1
49	47.3	12.7	99	95.6	25.6	49	143.9	38.6	99	192.2	51.5	49	240.5	64.4	99	288.8	77.4
50	48.3	12.9	100	96.6	25.9	150	144.9	38.8	200	193.2	51.8	250	241.5	64.7	300	289.8	77.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 75 Deg.

16 Difference of Latitude and Departure for 16 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	49.0	14.1	101	97.1	27.8	151	145.1	41.6	201	193.2	55.4	251	241.2	69.2
2	01.9	00.6	52	50.0	14.3	02	98.0	28.1	52	146.1	41.9	02	194.1	55.7	52	242.2	69.5
3	02.9	00.8	53	50.9	14.6	03	99.0	28.4	53	147.1	42.2	03	195.1	55.9	53	243.2	69.7
4	03.8	01.1	54	51.9	14.9	04	100.0	28.7	54	148.0	42.4	04	196.1	56.2	54	244.1	70.0
5	04.8	01.4	55	52.9	15.2	05	100.9	28.9	55	149.0	42.7	05	197.0	56.5	55	245.1	70.3
6	05.8	01.7	56	53.8	15.4	106	101.9	29.2	156	149.9	43.0	206	198.0	56.8	256	246.0	70.6
7	06.7	01.9	57	54.8	15.7	07	102.8	29.5	57	150.9	43.3	07	199.0	57.0	57	247.0	70.8
8	07.7	02.2	58	55.7	16.0	08	103.8	29.8	58	151.9	43.5	08	199.9	57.3	58	248.0	71.1
9	08.7	02.5	59	56.7	16.3	09	104.8	30.0	59	152.8	43.8	09	200.9	57.6	59	248.9	71.4
10	09.6	02.8	60	57.7	16.5	10	105.7	30.3	60	153.8	44.1	10	201.8	57.9	60	249.9	71.7
11	10.6	03.0	61	58.6	16.8	111	106.7	30.6	161	154.7	44.4	211	202.8	58.2	261	250.9	71.9
12	11.5	03.3	62	59.6	17.1	12	107.6	30.9	62	155.7	44.6	12	203.8	58.4	62	251.8	72.2
13	12.5	03.6	63	60.6	17.4	13	108.6	31.1	63	156.7	44.9	13	204.7	58.7	63	252.8	72.5
14	13.5	03.9	64	61.5	17.6	14	109.6	31.4	64	157.6	45.2	14	205.7	59.0	64	253.7	72.8
15	14.4	04.1	65	62.5	17.9	15	110.5	31.7	65	158.6	45.5	15	206.6	59.3	65	254.7	73.0
16	15.4	04.4	66	63.4	18.2	116	111.5	32.0	166	159.5	45.7	216	207.6	59.5	266	255.7	73.3
17	16.3	04.7	67	64.4	18.5	17	112.5	32.2	67	160.5	45.0	17	208.6	59.8	67	256.6	73.6
18	17.3	05.0	68	65.4	18.7	18	113.4	32.5	68	161.5	46.3	18	209.5	60.1	68	257.6	73.9
19	18.3	05.2	69	66.3	19.0	19	114.4	32.8	69	162.4	46.6	19	210.5	60.4	69	258.5	74.1
20	19.2	05.5	70	67.3	19.3	20	115.3	33.1	70	163.4	46.9	20	211.4	60.6	70	259.5	74.4
21	20.2	05.8	71	68.2	19.6	21	116.3	33.3	71	164.4	47.1	21	212.4	60.9	71	260.5	74.7
22	21.1	06.1	72	69.2	19.8	22	117.3	33.6	72	165.3	47.4	22	213.4	61.2	72	261.4	75.0
23	22.1	06.3	73	70.2	20.1	23	118.2	33.9	73	166.3	47.7	23	214.3	61.5	73	262.4	75.2
24	23.1	06.6	74	71.1	20.4	24	119.2	34.2	74	167.2	48.0	24	215.3	61.7	74	263.3	75.5
25	24.0	06.9	75	72.1	20.7	25	120.1	34.4	75	168.2	48.2	25	216.3	62.0	75	264.3	75.8
26	25.0	07.2	76	73.0	20.9	26	121.1	34.7	76	169.2	48.5	26	217.2	62.3	76	265.3	76.1
27	26.0	07.4	77	74.0	21.2	27	122.1	35.0	77	170.1	48.8	27	218.2	62.6	77	266.2	76.3
28	26.9	07.7	78	75.0	21.5	28	123.0	35.3	78	171.1	49.1	28	219.1	62.8	78	267.2	76.6
29	27.9	08.0	79	75.9	21.8	29	124.0	35.6	79	172.0	49.3	29	220.1	63.1	79	268.2	76.9
30	28.8	08.3	80	76.9	22.0	30	124.9	35.8	80	173.0	49.6	30	221.1	63.4	80	269.1	77.2
31	29.8	08.5	81	77.9	22.3	31	125.9	36.1	81	174.0	49.9	31	222.0	63.7	81	270.1	77.4
32	30.8	08.8	82	78.8	22.6	32	126.9	36.4	82	174.9	50.2	32	223.0	63.9	82	271.0	77.7
33	31.7	09.1	83	79.8	22.9	33	127.8	36.7	83	175.9	50.4	33	223.9	64.2	83	272.0	78.0
34	32.7	09.4	84	80.7	23.1	34	128.8	36.9	84	176.8	50.7	34	224.9	64.5	84	273.0	78.3
35	33.6	09.6	85	81.7	23.4	35	129.8	37.2	85	177.8	51.0	35	225.9	64.8	85	273.9	78.5
36	34.6	09.9	86	82.7	23.7	36	130.7	37.5	86	178.8	51.3	36	226.8	65.0	86	274.9	78.8
37	35.6	10.2	87	83.6	24.0	37	131.7	37.8	87	179.7	51.5	37	227.8	65.3	87	275.8	79.1
38	36.5	10.5	88	84.6	24.3	38	132.6	38.0	88	180.7	51.8	38	228.7	65.6	88	276.8	79.4
39	37.5	10.7	89	85.5	24.5	39	133.6	38.3	89	181.7	52.1	39	229.7	65.9	89	277.8	79.6
40	38.4	11.0	90	86.5	24.8	40	134.6	38.6	90	182.6	52.4	40	230.7	66.1	90	278.7	79.9
41	39.4	11.3	91	87.5	25.1	41	135.5	38.9	91	183.6	52.6	41	231.6	66.4	91	279.7	80.2
42	40.4	11.6	92	88.4	25.4	42	136.5	39.1	92	184.5	52.9	42	232.6	66.7	92	280.6	80.5
43	41.3	11.9	93	89.4	25.6	43	137.4	39.4	93	185.5	53.2	43	233.6	67.0	93	281.6	80.8
44	42.3	12.1	94	90.3	25.9	44	138.4	39.7	94	186.5	53.5	44	234.5	67.2	94	282.6	81.0
45	43.3	12.4	95	91.3	26.2	45	139.4	40.0	95	187.4	53.7	45	235.5	67.5	95	283.5	81.3
46	44.2	12.7	96	92.3	26.5	46	140.3	40.2	96	188.4	54.0	46	236.4	67.8	96	284.5	81.6
47	45.2	13.0	97	93.2	26.7	47	141.3	40.5	97	189.3	54.3	47	237.4	68.1	97	285.5	81.9
48	46.1	13.2	98	94.2	27.0	48	142.2	40.8	98	190.3	54.6	48	238.4	68.3	98	286.4	82.1
49	47.1	13.5	99	95.2	27.3	49	143.2	41.1	99	191.3	54.8	49	239.3	68.6	99	287.4	82.4
50	48.1	13.8	100	96.1	27.6	50	144.2	41.3	100	192.2	55.1	50	240.3	68.9	100	288.3	82.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 74 Deg.



# Difference of Latitude and Departure for 17 Deg. 17

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	48.8	14.9	101	96.6	29.5	151	144.4	44.1	201	192.2	58.8	251	240.0	73.3
2	01.9	00.6	52	49.7	15.2	02	97.5	29.8	52	145.1	44.4	02	193.2	59.0	52	241.0	73.6
3	02.9	00.9	53	50.7	15.5	03	98.5	30.1	53	146.1	44.7	03	194.1	59.3	53	241.9	73.9
4	03.8	01.2	54	51.6	15.8	04	99.4	30.4	54	147.3	45.0	04	195.1	59.6	54	242.9	74.1
5	04.8	01.5	55	52.6	16.1	05	100.4	30.7	55	148.2	45.3	05	196.0	59.9	55	243.8	74.4
6	05.7	01.8	56	53.5	16.4	106	101.4	31.0	156	149.2	45.6	206	197.0	60.2	256	244.8	74.7
7	06.7	02.0	57	54.5	16.7	07	102.3	31.3	57	150.1	45.9	07	197.9	60.5	57	245.8	75.0
8	07.6	02.3	58	55.5	17.0	08	103.3	31.6	58	151.1	46.2	08	198.9	60.8	58	246.7	75.3
9	08.6	02.6	59	56.4	17.2	09	104.2	31.9	59	152.0	46.5	09	199.9	61.1	59	247.7	75.6
10	09.6	02.9	60	57.4	17.5	10	105.2	32.2	60	153.0	46.8	10	200.8	61.4	60	248.6	75.9
11	10.5	03.2	61	58.3	17.8	111	106.1	32.4	161	154.0	47.1	211	201.8	61.7	261	249.6	76.2
12	11.5	03.5	62	59.3	18.1	12	107.1	32.7	62	154.9	47.4	12	202.7	62.0	62	250.5	76.5
13	12.4	03.8	63	60.2	18.4	13	108.2	33.0	63	155.9	47.6	13	203.7	62.3	63	251.5	76.8
14	13.4	04.1	64	61.2	18.7	14	109.0	33.3	64	156.8	47.9	14	204.6	62.6	64	252.4	77.1
15	14.3	04.4	65	62.2	19.0	15	110.0	33.6	65	157.8	48.2	15	205.6	62.8	65	253.4	77.4
16	15.3	04.7	66	63.1	19.3	116	110.9	33.9	166	158.7	48.5	216	206.5	63.1	266	254.4	77.7
17	16.3	05.0	67	64.1	19.6	17	111.9	34.2	67	159.7	48.8	17	207.5	63.4	67	255.3	77.9
18	17.2	05.3	68	65.0	19.9	18	112.8	34.5	68	160.6	49.1	18	208.5	63.7	68	256.3	78.2
19	18.2	05.6	69	66.0	20.2	19	113.8	34.8	69	161.6	49.4	19	209.4	64.0	69	257.2	78.5
20	19.1	05.8	70	66.9	20.5	20	114.7	35.1	70	162.6	49.7	20	210.4	64.3	70	258.2	78.8
21	20.1	06.1	71	67.9	20.8	121	115.7	35.4	171	163.5	50.0	221	211.3	64.6	271	259.1	79.1
22	21.0	06.4	72	68.8	21.1	22	116.7	35.7	72	164.5	50.3	22	212.3	64.9	72	260.1	79.4
23	22.0	06.7	73	69.8	21.3	23	117.6	36.0	73	165.4	50.6	23	213.2	65.2	73	261.1	79.7
24	22.9	07.0	74	70.8	21.6	24	118.6	36.2	74	166.4	50.9	24	214.2	65.5	74	262.0	80.0
25	23.9	07.3	75	71.7	21.9	25	119.5	36.5	75	167.3	51.2	25	215.2	65.8	75	263.0	80.3
26	24.9	07.6	76	72.7	22.2	126	120.5	36.8	176	168.3	51.4	226	216.1	66.1	276	263.9	80.6
27	25.8	07.9	77	73.6	22.5	27	121.4	37.1	77	169.3	51.7	27	217.1	66.4	77	264.9	80.9
28	26.8	08.2	78	74.6	22.8	28	122.4	37.4	78	170.2	52.0	28	218.0	66.6	78	265.8	81.2
29	27.7	08.5	79	75.5	23.1	29	123.4	37.7	79	171.2	52.3	29	219.0	66.9	79	266.8	81.5
30	28.7	08.8	80	76.5	23.4	30	124.3	38.0	80	172.1	52.6	30	219.9	67.2	80	267.7	81.7
31	29.6	09.1	81	77.5	23.7	131	125.3	38.3	181	173.1	52.9	231	220.9	67.5	281	268.7	82.0
32	30.6	09.4	82	78.4	24.0	32	126.2	38.6	82	174.0	53.2	32	221.8	67.8	82	269.7	82.3
33	31.6	09.6	83	79.4	24.3	33	127.2	38.9	83	175.0	53.5	33	222.8	68.1	83	270.6	82.6
34	32.5	09.9	84	80.3	24.6	34	128.1	39.2	84	175.9	53.8	34	223.7	68.4	84	271.6	82.9
35	33.5	10.2	85	81.3	24.8	35	129.1	39.5	85	176.9	54.1	35	224.7	68.7	85	272.5	83.2
36	34.4	10.5	86	82.2	25.1	136	130.0	39.8	186	177.9	54.4	236	225.7	69.0	286	273.5	83.5
37	35.4	10.8	87	83.2	25.4	37	131.0	40.0	87	178.8	54.7	37	226.6	69.3	87	274.4	83.8
38	36.3	11.1	88	84.1	25.7	38	132.0	40.3	88	179.8	55.0	38	227.6	69.6	88	275.4	84.1
39	37.3	11.4	89	85.1	26.0	39	132.9	40.6	89	180.7	55.2	39	228.5	69.9	89	276.4	84.4
40	38.2	11.7	90	86.1	26.3	40	133.9	40.9	90	181.7	55.5	40	229.5	70.2	90	277.3	84.7
41	39.2	12.0	91	87.0	26.6	141	134.8	41.2	191	182.6	55.8	241	230.5	70.4	291	278.3	85.0
42	40.2	12.3	92	88.0	26.9	42	135.8	41.5	92	183.6	56.1	42	231.4	70.7	92	279.2	85.3
43	41.1	12.6	93	88.9	27.2	43	136.7	41.8	93	184.6	56.4	43	232.4	71.0	93	280.2	85.6
44	42.1	12.9	94	89.9	27.5	44	137.7	42.1	94	185.5	56.7	44	233.3	71.3	94	281.1	85.9
45	43.0	13.2	95	90.8	27.8	45	138.7	42.4	95	186.5	57.0	45	234.3	71.6	95	282.1	86.1
46	44.0	13.4	96	91.8	28.1	146	139.6	42.7	196	187.4	57.3	246	235.2	71.9	296	283.0	86.4
47	44.9	13.7	97	92.8	28.4	47	140.6	43.0	97	188.4	57.6	47	236.2	72.1	97	284.0	86.7
48	45.9	14.0	98	93.7	28.6	48	141.5	43.3	98	189.3	57.9	48	237.1	72.4	98	285.0	87.0
49	46.8	14.3	99	94.7	28.9	49	142.5	43.6	99	190.3	58.2	49	238.1	72.7	99	285.9	87.3
50	47.8	14.6	100	95.6	29.2	150	143.4	43.8	200	191.2	58.5	250	239.1	73.0	300	286.9	87.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

16 Difference of Latitude and Departure for 16 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	49.0	14.1	101	97.1	27.8	151	145.1	41.6	201	193.2	55.4	251	241.2	69.2
2	01.9	00.6	52	50.0	14.3	02	98.0	28.1	52	146.1	41.9	02	194.1	55.7	52	242.2	69.5
3	02.9	00.8	53	50.9	14.6	03	99.0	28.4	53	147.1	42.2	03	195.1	55.9	53	243.2	69.7
4	03.8	01.1	54	51.9	14.9	04	100.0	28.7	54	148.0	42.4	04	196.1	56.2	54	244.1	70.0
5	04.8	01.4	55	52.9	15.2	05	100.9	28.9	55	149.0	42.7	05	197.0	56.5	55	245.1	70.3
6	05.8	01.7	56	53.8	15.4	106	101.9	29.2	156	149.9	43.0	206	198.0	56.8	256	246.0	70.6
7	06.7	01.9	57	54.8	15.7	07	102.8	29.5	57	150.9	43.3	07	199.0	57.0	57	247.0	70.8
8	07.7	02.2	58	55.7	16.0	08	103.8	29.8	58	151.9	43.5	08	199.9	57.3	58	248.0	71.1
9	08.7	02.5	59	56.7	16.3	09	104.8	30.0	59	152.8	43.8	09	200.9	57.6	59	248.9	71.4
10	09.6	02.8	60	57.7	16.5	10	105.7	30.3	60	153.8	44.1	10	201.8	57.9	60	249.9	71.7
11	10.6	03.0	61	58.6	16.8	111	106.7	30.6	161	154.7	44.4	211	202.8	58.2	261	250.9	71.9
12	11.5	03.3	62	59.6	17.1	12	107.6	30.9	62	155.7	44.6	12	203.8	58.4	62	251.8	72.2
13	12.5	03.6	63	60.6	17.4	13	108.6	31.1	63	156.7	44.9	13	204.7	58.7	63	252.8	72.5
14	13.5	03.9	64	61.5	17.6	14	109.6	31.4	64	157.6	45.2	14	205.7	59.0	64	253.7	72.8
15	14.4	04.1	65	62.5	17.9	15	110.5	31.7	65	158.6	45.5	15	206.6	59.3	65	254.7	73.0
16	15.4	04.4	66	63.4	18.2	116	111.5	32.0	166	159.5	45.7	216	207.6	59.5	266	255.7	73.3
17	16.3	04.7	67	64.4	18.5	17	112.5	32.2	67	160.5	45.0	17	208.6	59.8	67	256.6	73.6
18	17.3	05.0	68	65.4	18.7	18	113.4	32.5	68	161.5	46.3	18	209.5	60.1	68	257.6	73.9
19	18.3	05.2	69	66.3	19.0	19	114.4	32.8	69	162.4	46.6	19	210.5	60.4	69	258.5	74.1
20	19.2	05.5	70	67.3	19.3	20	115.3	33.1	70	163.4	46.9	20	211.4	60.6	70	259.5	74.4
21	20.2	05.8	71	68.2	19.6	21	116.3	33.3	171	164.4	47.1	221	212.4	60.9	271	260.5	74.7
22	21.1	06.1	72	69.2	19.8	22	117.3	33.6	72	165.3	47.4	22	213.4	61.2	72	261.4	75.0
23	22.1	06.3	73	70.2	20.1	23	118.2	33.9	73	166.3	47.7	23	214.3	61.5	73	262.4	75.2
24	23.1	06.6	74	71.1	20.4	24	119.2	34.2	74	167.2	48.0	24	215.3	61.7	74	263.3	75.5
25	24.0	06.9	75	72.1	20.7	25	120.1	34.4	75	168.2	48.2	25	216.3	62.0	75	264.3	75.8
26	25.0	07.2	76	73.0	20.9	126	121.1	34.7	176	169.2	48.5	226	217.2	62.3	276	265.3	76.1
27	26.0	07.4	77	74.0	21.2	27	122.1	35.0	77	170.1	48.8	27	218.2	62.6	77	266.2	76.3
28	26.9	07.7	78	75.0	21.5	28	123.0	35.3	78	171.1	49.1	28	219.1	62.8	78	267.2	76.6
29	27.9	08.0	79	75.9	21.8	29	124.0	35.6	79	172.0	49.3	29	220.1	63.1	79	268.2	76.9
30	28.8	08.3	80	76.9	22.0	30	124.9	35.8	80	173.0	49.6	30	221.1	63.4	80	269.1	77.2
31	29.8	08.5	81	77.9	22.3	131	125.9	36.1	181	174.0	49.9	231	222.0	63.7	281	270.1	77.4
32	30.8	08.8	82	78.8	22.6	32	126.9	36.4	82	174.9	50.2	32	223.0	63.9	82	271.0	77.7
33	31.7	09.1	83	79.8	22.9	33	127.8	36.7	83	175.9	50.4	33	223.9	64.2	83	272.0	78.0
34	32.7	09.4	84	80.7	23.1	34	128.8	36.9	84	176.8	50.7	34	224.9	64.5	84	273.0	78.3
35	33.6	09.6	85	81.7	23.4	35	129.8	37.2	85	177.8	51.0	35	225.9	64.8	85	273.9	78.5
36	34.6	09.9	86	82.7	23.7	136	130.7	37.5	186	178.8	51.3	236	226.8	65.0	286	274.9	78.8
37	35.6	10.2	87	83.6	24.0	37	131.7	37.8	87	179.7	51.5	37	227.8	65.3	87	275.8	79.1
38	36.5	10.5	88	84.6	24.3	38	132.6	38.0	88	180.7	51.8	38	228.7	65.6	88	276.8	79.4
39	37.5	10.7	89	85.5	24.5	39	133.6	38.3	89	181.7	52.1	39	229.7	65.9	89	277.8	79.6
40	38.4	11.0	90	86.5	24.8	40	134.6	38.6	90	182.6	52.4	40	230.7	66.1	90	278.7	79.9
41	39.4	11.3	91	87.5	25.1	141	135.5	38.9	191	183.6	52.6	241	231.6	66.4	291	279.7	80.2
42	40.4	11.6	92	88.4	25.4	42	136.5	39.1	92	184.5	52.9	42	232.6	66.7	92	280.6	80.5
43	41.3	11.9	93	89.4	25.6	43	137.4	39.4	93	185.5	53.2	43	233.6	67.0	93	281.6	80.8
44	42.3	12.1	94	90.3	25.9	44	138.4	39.7	94	186.5	53.5	44	234.5	67.2	94	282.6	81.0
45	43.3	12.4	95	91.3	26.2	45	139.4	40.0	95	187.4	53.7	45	235.5	67.5	95	283.5	81.3
46	44.2	12.7	96	92.3	26.5	146	140.3	40.2	196	188.4	54.0	246	236.4	67.8	296	284.5	81.6
47	45.2	13.0	97	93.2	26.7	47	141.3	40.5	97	189.3	54.3	47	237.4	68.1	97	285.5	81.9
48	46.1	13.2	98	94.2	27.0	48	142.2	40.8	98	190.3	54.6	48	238.4	68.3	98	286.4	82.1
49	47.1	13.5	99	95.2	27.3	49	143.2	41.1	99	191.3	54.8	49	239.3	68.6	99	287.4	82.4
50	48.1	13.8	100	96.1	27.6	150	144.2	41.3	200	192.2	55.1	250	240.3	68.9	300	288.3	82.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 74 Deg.



# Difference of Latitude and Departure for 17 Deg. 17

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	48.8	14.9	101	96.6	29.5	151	144.4	44.1	201	192.2	58.8	251	240.0	73.3
2	01.9	00.6	52	49.7	15.2	02	97.5	29.8	52	145.1	44.4	02	193.2	59.0	52	241.0	73.6
3	02.9	00.9	53	50.7	15.5	03	98.5	30.1	53	146.3	44.7	03	194.1	59.3	53	241.9	73.9
4	03.8	01.2	54	51.6	15.8	04	99.4	30.4	54	147.3	45.0	04	195.1	59.6	54	242.9	74.1
5	04.8	01.5	55	52.6	16.1	05	100.4	30.7	55	148.2	45.3	05	196.0	59.9	55	243.8	74.4
6	05.7	01.8	56	53.5	16.4	106	101.4	31.0	156	149.2	45.6	206	197.0	60.2	256	244.8	74.7
7	06.7	02.0	57	54.5	16.7	07	102.3	31.3	57	150.1	45.9	07	197.9	60.5	57	245.8	75.0
8	07.6	02.3	58	55.5	17.0	08	103.3	31.6	58	151.1	46.2	08	198.9	60.8	58	246.7	75.3
9	08.6	02.6	59	56.4	17.2	09	104.2	31.9	59	152.0	46.5	09	199.9	61.1	59	247.7	75.6
10	09.6	02.9	60	57.4	17.5	10	105.2	32.2	60	153.0	46.8	10	200.8	61.4	60	248.6	75.9
11	10.5	03.2	61	58.3	17.8	111	106.1	32.4	161	154.0	47.1	211	201.8	61.7	261	249.6	76.2
12	11.5	03.5	62	59.3	18.1	12	107.1	32.7	62	154.9	47.4	12	202.7	62.0	62	250.5	76.5
13	12.4	03.8	63	60.2	18.4	13	108.2	33.0	63	155.9	47.6	13	203.7	62.3	63	251.5	76.8
14	13.4	04.1	64	61.2	18.7	14	109.0	33.3	64	156.8	47.9	14	204.6	62.6	64	252.4	77.1
15	14.3	04.4	65	62.2	19.0	15	110.0	33.6	65	157.8	48.2	15	205.6	62.8	65	253.4	77.4
16	15.3	04.7	66	63.1	19.3	116	110.9	33.9	166	158.7	48.5	216	206.5	63.1	266	254.4	77.7
17	16.3	05.0	67	64.1	19.6	17	111.9	34.2	67	159.7	48.8	17	207.5	63.4	67	255.3	77.9
18	17.2	05.3	68	65.0	19.9	18	112.8	34.5	68	160.6	49.1	18	208.5	63.7	68	256.3	78.2
19	18.2	05.6	69	66.0	20.2	19	113.8	34.8	69	161.6	49.4	19	209.4	64.0	69	257.2	78.5
20	19.1	05.8	70	66.9	20.5	20	114.7	35.1	70	162.6	49.7	20	210.4	64.3	70	258.2	78.8
21	20.1	06.1	71	67.9	20.8	121	115.7	35.4	171	163.5	50.0	221	211.3	64.6	271	259.1	79.1
22	21.0	06.4	72	68.8	21.1	22	116.7	35.7	72	164.5	50.3	22	212.3	64.9	72	260.1	79.4
23	22.0	06.7	73	69.8	21.3	23	117.6	36.0	73	165.4	50.6	23	213.2	65.2	73	261.1	79.7
24	22.9	07.0	74	70.8	21.6	24	118.6	36.2	74	166.4	50.9	24	214.2	65.5	74	262.0	80.0
25	23.9	07.3	75	71.7	21.9	25	119.5	36.5	75	167.3	51.2	25	215.2	65.8	75	263.0	80.3
26	24.9	07.6	76	72.7	22.2	126	120.5	36.8	176	168.3	51.4	226	216.1	66.1	276	263.9	80.6
27	25.8	07.9	77	73.6	22.5	27	121.4	37.1	77	169.3	51.7	27	217.1	66.4	77	264.9	80.9
28	26.8	08.2	78	74.6	22.8	28	122.4	37.4	78	170.2	52.0	28	218.0	66.6	78	265.8	81.2
29	27.7	08.5	79	75.5	23.1	29	123.4	37.7	79	171.2	52.3	29	219.0	66.9	79	266.8	81.5
30	28.7	08.8	80	76.5	23.4	30	124.3	38.0	80	172.1	52.6	30	219.9	67.2	80	267.7	81.7
31	29.6	09.1	81	77.5	23.7	131	125.3	38.3	181	173.1	52.9	231	220.9	67.5	281	268.7	82.0
32	30.6	09.4	82	78.4	24.0	32	126.2	38.6	82	174.0	53.2	32	221.8	67.8	82	269.7	82.3
33	31.6	09.6	83	79.4	24.3	33	127.2	38.9	83	175.0	53.5	33	222.8	68.1	83	270.6	82.6
34	32.5	09.9	84	80.3	24.6	34	128.1	39.2	84	175.9	53.8	34	223.7	68.4	84	271.6	82.9
35	33.5	10.2	85	81.3	24.8	35	129.1	39.5	85	176.9	54.1	35	224.7	68.7	85	272.5	83.2
36	34.4	10.5	86	82.2	25.1	136	130.0	39.8	186	177.9	54.4	236	225.7	69.0	286	273.5	83.5
37	35.4	10.8	87	83.2	25.4	37	131.0	40.0	87	178.8	54.7	37	226.6	69.3	87	274.4	83.8
38	36.3	11.1	88	84.1	25.7	38	132.0	40.3	88	179.8	55.0	38	227.6	69.6	88	275.4	84.1
39	37.3	11.4	89	85.1	26.0	39	132.9	40.6	89	180.7	55.2	39	228.5	69.9	89	276.4	84.4
40	38.2	11.7	90	86.1	26.3	40	133.9	40.9	90	181.7	55.5	40	229.5	70.2	90	277.3	84.7
41	39.2	12.0	91	87.0	26.6	141	134.8	41.2	191	182.6	55.8	241	230.5	70.4	291	278.3	85.0
42	40.2	12.3	92	88.0	26.9	42	135.8	41.5	92	183.6	56.1	42	231.4	70.7	92	279.2	85.3
43	41.1	12.6	93	88.9	27.2	43	136.7	41.8	93	184.6	56.4	43	232.4	71.0	93	280.2	85.5
44	42.1	12.9	94	89.9	27.5	44	137.7	42.1	94	185.5	56.7	44	233.3	71.3	94	281.1	85.8
45	43.0	13.2	95	90.8	27.8	45	138.7	42.4	95	186.5	57.0	45	234.3	71.6	95	282.1	86.1
46	44.0	13.4	96	91.8	28.1	146	139.6	42.7	196	187.4	57.3	246	235.2	71.9	296	283.0	86.4
47	44.9	13.7	97	92.8	28.4	47	140.6	43.0	97	188.4	57.6	47	236.2	72.1	97	284.0	86.7
48	45.9	14.0	98	93.7	28.6	48	141.5	43.3	98	189.3	57.9	48	237.1	72.4	98	285.0	87.0
49	46.8	14.3	99	94.7	28.9	49	142.5	43.6	99	190.3	58.2	49	238.1	72.7	99	285.9	87.3
50	47.8	14.6	100	95.6	29.2	150	143.4	43.8	200	191.2	58.5	250	239.1	73.0	300	286.9	87.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

G

for 73 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	51	48.9	15.8	101	96.1	31.2	151	143.6	46.7	201	191.2	62.1	251	238.7	77.6
2	01.9	00.6	52	49.5	16.1	02	97.0	31.5	52	144.6	47.0	02	192.1	62.4	52	239.7	77.9
3	02.9	00.9	53	50.4	16.4	03	98.0	31.8	53	145.5	47.3	03	193.1	62.7	53	240.6	78.2
4	03.8	01.2	54	51.4	16.7	04	98.9	32.2	54	146.5	47.6	04	194.0	63.0	54	241.6	78.5
5	04.8	01.5	55	52.3	17.0	05	99.9	32.4	55	147.4	47.9	05	195.0	63.3	55	242.5	78.8
6	05.7	01.9	56	53.3	17.3	106	100.8	32.8	156	148.4	48.2	206	195.9	63.7	256	243.5	79.1
7	06.7	02.2	57	54.2	17.6	07	101.8	33.1	57	149.3	48.5	07	196.9	64.0	57	244.4	79.4
8	07.6	02.5	58	55.2	17.9	08	102.7	33.4	58	150.3	48.8	08	197.8	64.3	58	245.4	79.7
9	08.6	02.8	59	56.1	18.2	09	103.7	33.7	59	151.2	49.1	09	198.8	64.6	59	246.3	80.0
10	09.5	03.1	60	57.1	18.5	10	104.6	34.0	60	152.2	49.4	10	199.7	64.9	60	247.3	80.3
11	10.5	03.4	61	58.0	18.8	111	105.6	34.3	161	153.1	49.7	211	200.7	65.2	261	248.2	80.6
12	11.4	03.7	62	59.0	19.2	12	106.5	34.6	62	154.1	50.1	12	201.6	65.5	62	249.2	81.0
13	12.4	04.0	63	59.9	19.5	13	107.5	34.9	63	155.0	50.4	13	202.6	65.8	63	250.1	81.3
14	13.3	04.3	64	60.9	19.8	14	108.4	35.2	64	156.0	50.7	14	203.5	66.1	64	251.1	81.6
15	14.3	04.6	65	61.8	20.1	15	109.4	35.5	65	156.9	51.0	15	204.5	66.4	65	252.0	81.9
16	15.2	04.9	66	62.8	20.4	116	110.3	35.8	166	157.9	51.3	216	205.4	66.7	266	253.0	82.2
17	16.2	05.3	67	63.7	20.7	17	111.3	36.2	67	158.8	51.6	17	206.4	67.1	67	253.9	82.5
18	17.1	05.6	68	64.7	21.0	18	112.2	36.5	68	159.8	51.9	18	207.3	67.4	68	254.9	82.8
19	18.1	05.9	69	65.6	21.3	19	113.2	36.8	69	160.7	52.2	19	208.3	67.7	69	255.8	83.1
20	19.0	06.2	70	66.6	21.6	20	114.1	37.1	70	161.7	52.5	20	209.2	68.0	70	256.8	83.4
21	20.0	06.5	71	67.5	21.9	121	115.1	37.4	171	162.6	52.8	221	210.2	68.3	271	257.7	83.7
22	20.9	06.8	72	68.5	22.2	22	116.0	37.7	72	163.6	53.1	22	211.1	68.6	72	258.7	84.0
23	21.9	07.1	73	69.4	22.6	23	117.0	38.0	73	164.5	53.5	23	212.1	68.9	73	259.6	84.4
24	22.8	07.4	74	70.4	22.9	24	117.9	38.3	74	165.5	53.8	24	213.0	69.2	74	260.6	84.7
25	23.8	07.7	75	71.3	23.2	25	118.9	38.6	75	166.4	54.1	25	214.0	69.5	75	261.5	85.0
26	24.7	08.0	76	72.3	23.5	126	119.8	38.9	176	167.4	54.4	226	214.9	69.8	276	262.5	85.3
27	25.7	08.3	77	73.2	23.8	27	120.8	39.2	77	168.3	54.7	27	215.9	70.1	77	263.4	85.6
28	26.6	08.7	78	74.2	24.1	28	121.7	39.6	78	169.3	55.0	28	216.8	70.5	78	264.4	85.9
29	27.6	09.0	79	75.1	24.4	29	122.7	39.9	79	170.2	55.3	29	217.8	70.8	79	265.3	86.2
30	28.5	09.3	80	76.1	24.7	30	123.6	40.2	80	171.2	55.6	30	218.7	71.1	80	266.3	86.5
31	29.5	09.6	81	77.0	25.0	131	124.6	40.5	181	172.1	55.9	231	219.7	71.4	281	267.2	86.8
32	30.4	09.9	82	78.0	25.3	32	125.5	40.8	82	173.1	56.2	32	220.6	71.7	82	268.2	87.1
33	31.4	10.2	83	78.9	25.6	33	126.5	41.1	83	174.0	56.5	33	221.6	72.0	83	269.1	87.4
34	32.3	10.5	84	79.9	26.0	34	127.4	41.4	84	175.0	56.9	34	222.5	72.3	84	270.1	87.8
35	33.3	10.8	85	80.8	26.3	35	128.4	41.7	85	175.9	57.2	35	223.5	72.6	85	271.0	88.1
36	34.2	11.1	86	81.8	26.6	136	129.3	42.0	186	176.9	57.5	236	224.4	72.9	286	272.0	88.4
37	35.2	11.4	87	82.7	26.9	37	130.3	42.3	87	177.8	57.8	37	225.4	73.2	87	272.9	88.7
38	36.1	11.7	88	83.7	27.2	38	131.2	42.6	88	178.8	58.1	38	226.3	73.5	88	273.9	89.0
39	37.1	12.1	89	84.6	27.5	39	132.2	43.0	89	179.7	58.4	39	227.3	73.9	89	274.8	89.3
40	38.0	12.4	90	85.6	27.8	40	133.1	43.3	90	180.7	58.7	40	228.2	74.2	90	275.8	89.6
41	39.0	12.7	91	86.5	28.1	141	134.1	43.6	191	181.6	59.0	241	229.2	74.5	291	276.7	89.9
42	39.9	13.0	92	87.5	28.4	42	135.0	43.9	92	182.6	59.3	42	230.1	74.8	92	277.7	90.2
43	40.9	13.3	93	88.4	28.7	43	136.0	44.2	93	183.5	59.6	43	231.1	75.1	93	278.6	90.5
44	41.8	13.6	94	89.4	29.0	44	136.9	44.5	94	184.5	59.9	44	232.0	75.4	94	279.6	90.8
45	42.8	13.9	95	90.3	29.4	45	137.9	44.8	95	185.4	60.3	45	233.0	75.7	95	280.5	91.2
46	43.7	14.2	96	91.3	29.7	146	138.8	45.1	196	186.4	60.6	246	233.9	76.0	296	281.5	91.5
47	44.7	14.5	97	92.2	30.0	47	139.8	45.4	97	187.3	60.9	47	234.9	76.3	97	282.4	91.8
48	45.6	14.8	98	93.2	30.3	48	140.7	45.7	98	188.3	61.2	48	235.8	76.6	98	283.4	92.1
49	46.6	15.1	99	94.1	30.6	49	141.7	46.0	99	189.2	61.5	49	236.8	76.9	99	284.4	92.4
50	47.6	15.5	100	95.1	30.9	150	142.7	46.4	200	190.2	61.8	250	237.8	77.3	300	285.3	92.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 72 Deg.



# Difference of Latitude and Departure for 19 Deg. 19

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.3	51	48.2	16.6	101	95.5	32.9	151	142.8	49.2	201	190.0	65.4	251	237.3	81.7
2	01.9	00.7	52	49.2	16.9	02	96.4	33.2	52	143.7	49.5	02	191.0	65.8	52	238.3	82.1
3	02.8	01.0	53	50.1	17.3	03	97.4	33.5	53	144.7	49.8	03	191.9	66.1	53	239.2	82.4
4	03.8	01.3	54	51.1	17.6	04	98.3	33.9	54	145.6	50.1	04	192.9	66.4	54	240.1	82.7
5	04.7	01.6	55	52.0	17.9	05	99.3	34.2	55	146.5	50.5	05	193.8	66.7	55	241.1	83.0
6	05.7	02.0	56	52.9	18.2	106	100.2	34.5	156	147.5	50.8	206	194.8	67.1	256	242.0	83.4
7	06.6	02.3	57	53.9	18.6	07	101.2	34.8	57	148.4	51.1	07	195.7	67.4	57	243.0	83.7
8	07.6	02.6	58	54.8	18.9	08	102.1	35.2	58	149.4	51.4	08	196.7	67.7	58	243.9	84.0
9	08.5	02.9	59	55.8	19.2	09	103.1	35.5	59	150.3	51.8	09	197.6	68.1	59	244.9	84.3
10	09.5	03.3	60	56.7	19.5	10	104.0	35.8	60	151.3	52.1	10	198.5	68.4	60	245.8	84.7
11	10.4	03.6	61	57.7	19.9	111	104.5	36.1	161	152.2	52.4	211	199.5	68.7	261	246.8	85.0
12	11.3	03.9	62	58.6	20.2	12	105.9	36.5	62	153.2	52.7	12	200.4	69.0	62	247.7	85.3
13	12.3	04.2	63	59.6	20.5	13	106.8	36.8	63	154.1	53.1	13	201.4	69.4	63	248.7	85.6
14	13.2	04.6	64	60.5	20.8	14	107.8	37.1	64	155.1	53.4	14	202.3	69.7	64	249.6	86.0
15	14.2	04.9	65	61.5	21.2	15	108.7	37.4	65	156.0	53.7	15	203.3	70.0	65	250.5	86.3
16	15.1	05.2	66	62.4	21.5	116	109.7	37.8	166	156.9	54.0	216	204.2	70.3	266	251.5	86.6
17	16.1	05.5	67	63.3	21.8	17	110.6	38.1	67	157.9	54.4	17	205.2	70.7	67	252.4	86.9
18	17.0	05.9	68	64.3	22.1	18	111.6	38.4	68	158.8	54.7	18	206.1	71.0	68	253.4	87.3
19	18.0	06.2	69	65.2	22.5	19	112.5	38.7	69	159.8	55.0	19	207.1	71.3	69	254.3	87.6
20	18.9	06.5	70	66.2	22.8	20	113.5	39.1	70	160.7	55.4	20	208.0	71.6	70	255.3	87.9
21	19.9	06.8	71	67.1	23.1	121	114.4	39.4	171	161.7	55.7	221	208.9	72.0	271	256.2	88.2
22	20.8	07.2	72	68.1	23.4	22	115.3	39.7	72	162.6	56.0	22	209.9	72.3	72	257.2	88.6
23	21.7	07.5	73	69.0	23.8	23	116.3	40.0	73	163.6	56.3	23	210.8	72.6	73	258.1	88.6
24	22.7	07.8	74	70.0	24.1	24	117.2	40.4	74	164.5	56.7	24	211.8	72.9	74	259.1	89.2
25	23.6	08.1	75	70.9	24.4	25	118.2	40.7	75	165.5	57.0	25	212.7	73.3	75	260.0	89.5
26	24.6	08.5	76	71.9	24.7	126	119.1	41.0	176	166.4	57.3	226	213.7	73.6	276	260.9	89.9
27	25.5	08.8	77	72.8	25.1	27	120.1	41.4	77	167.3	57.6	27	214.6	73.9	77	261.9	90.2
28	26.5	09.1	78	73.7	25.4	28	121.0	41.7	78	168.3	58.0	28	215.6	74.2	78	262.8	90.5
29	27.4	09.4	79	74.7	25.7	29	122.0	42.0	79	169.2	58.3	29	216.5	74.6	79	263.8	90.8
30	28.4	09.8	80	75.6	26.0	30	122.9	42.3	80	170.2	58.6	30	217.5	74.9	80	264.7	91.2
31	29.3	10.1	81	76.6	26.4	131	123.0	42.7	181	171.1	58.9	231	218.4	75.2	281	265.7	91.5
32	30.3	10.4	82	77.5	26.7	32	124.8	43.0	82	172.1	59.3	32	219.3	75.5	82	266.6	91.8
33	31.2	10.7	83	78.5	27.0	33	125.7	43.3	83	173.0	59.6	33	220.3	75.9	83	267.6	92.1
34	32.1	11.1	84	79.4	27.4	34	126.7	43.6	84	174.0	59.9	34	221.2	76.2	84	268.5	92.5
35	33.1	11.4	85	80.4	27.7	35	127.6	44.0	85	174.9	60.2	35	222.2	76.5	85	269.5	92.8
36	34.0	11.7	86	81.3	28.0	136	128.6	44.3	186	175.9	60.6	236	223.1	76.8	286	270.4	93.1
37	35.0	12.0	87	82.3	28.3	37	129.5	44.6	87	176.8	60.9	37	224.1	77.2	87	271.3	93.4
38	35.9	12.4	88	83.2	28.7	38	130.5	44.9	88	177.7	61.2	38	225.0	77.5	88	272.3	93.8
39	36.9	12.7	89	84.1	29.0	39	131.4	45.3	89	178.7	61.5	39	226.0	77.8	89	273.2	94.1
40	37.8	13.0	90	85.1	29.3	40	132.4	45.6	90	179.6	61.9	40	226.9	78.1	90	274.2	94.4
41	38.8	13.3	91	86.0	29.6	141	133.3	45.9	191	180.6	62.2	241	227.9	78.5	291	275.1	94.7
42	39.7	13.7	92	87.0	30.0	42	134.3	46.2	92	181.5	62.5	42	228.8	78.8	92	276.1	95.1
43	40.7	14.0	93	87.9	30.3	43	135.2	46.6	93	182.5	62.8	43	229.7	79.1	93	277.0	95.4
44	41.6	14.3	94	88.9	30.6	44	136.1	46.9	94	183.4	63.2	44	230.7	79.4	94	278.0	95.7
45	42.5	14.7	95	89.8	30.0	45	137.1	47.2	95	184.4	63.5	45	231.6	79.8	95	278.9	96.1
46	43.5	15.0	96	90.8	31.3	146	138.0	47.5	196	185.3	63.8	246	232.6	80.1	296	279.9	96.4
47	44.4	15.3	97	91.7	31.6	47	139.0	47.9	97	186.3	64.1	47	233.5	80.4	97	280.8	96.7
48	45.4	15.6	98	92.7	31.9	48	139.9	48.2	98	187.2	64.5	48	234.5	80.7	98	281.7	97.0
49	46.3	16.0	99	93.6	32.2	49	140.9	48.5	99	188.1	64.8	49	235.4	81.1	99	282.7	97.4
50	47.3	16.3	100	94.5	32.6	150	141.8	48.8	200	189.1	65.1	250	236.4	81.4	300	283.6	97.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 71 Deg.

20 Difference of Latitude and Departure for 20 Deg.

Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	00.9	00.3	51	47.5	17.4	101	94.9	34.5	151	141.9	51.6	201	188.9	68.7	251	235.9	85.8
2	01.9	00.7	52	48.6	17.8	02	95.8	34.9	52	142.8	52.0	02	189.8	69.1	52	236.8	86.2
3	02.8	01.0	53	49.8	18.1	03	96.8	35.2	53	143.8	52.3	03	190.8	69.4	53	237.7	86.5
4	03.8	01.4	54	50.7	18.5	04	97.7	35.6	54	144.7	52.7	04	191.7	69.8	54	238.7	86.9
5	04.7	01.7	55	51.7	18.8	05	98.7	35.9	55	145.7	53.0	05	192.6	70.1	55	239.6	87.2
6	05.6	02.1	56	52.6	19.2	106	99.6	36.3	156	146.6	53.4	206	193.6	70.5	256	240.6	87.6
7	06.6	02.4	57	53.6	19.5	07	100.5	36.6	57	147.5	53.7	07	194.5	70.8	57	241.5	87.9
8	07.5	02.7	58	54.5	19.8	08	101.5	36.9	58	148.5	54.0	08	195.5	71.1	58	242.4	88.2
9	08.5	03.1	59	55.4	20.2	09	102.4	37.3	59	149.4	54.4	09	196.4	71.5	59	243.4	88.6
10	09.4	03.4	60	56.4	20.5	10	103.4	37.6	60	150.4	54.7	10	197.3	71.8	60	244.3	88.9
11	10.3	03.8	61	57.3	20.9	111	104.3	38.0	161	151.3	55.1	211	198.3	72.2	261	245.3	89.3
12	11.3	04.1	62	58.3	21.2	12	105.2	38.3	62	152.2	55.4	12	199.2	72.5	62	246.2	89.6
13	12.2	04.4	63	59.2	21.5	13	106.2	38.6	63	153.2	55.7	13	200.2	72.8	63	247.1	89.9
14	13.2	04.8	64	60.1	21.9	14	107.1	39.0	64	154.1	56.1	14	201.1	73.2	64	248.1	90.3
15	14.1	05.1	65	61.1	22.2	15	108.1	39.3	65	155.1	56.4	15	202.0	73.5	65	249.0	90.6
16	15.0	05.5	66	62.0	22.6	116	109.0	39.7	166	156.0	56.8	216	203.0	73.9	266	250.0	91.0
17	16.0	05.8	67	63.0	22.9	17	109.9	40.0	67	156.9	57.1	17	203.9	74.2	67	250.9	91.3
18	16.9	06.2	68	63.9	23.3	18	110.9	40.4	68	157.9	57.5	18	204.9	74.6	68	251.8	91.7
19	17.9	06.5	69	64.8	23.6	19	111.8	40.7	69	158.8	57.8	19	205.8	74.9	69	252.8	92.0
20	18.8	06.8	70	65.8	23.9	20	112.8	41.0	70	159.7	58.1	20	206.7	75.2	70	253.7	92.3
21	19.7	07.2	71	66.7	24.3	121	113.7	41.4	171	160.7	58.5	221	207.7	75.6	271	254.7	92.7
22	20.7	07.5	72	67.7	24.6	22	114.6	41.7	72	161.6	58.8	22	208.6	75.9	72	255.6	93.0
23	21.6	07.9	73	68.6	25.0	23	115.6	42.1	73	162.6	59.2	23	209.6	76.3	73	256.5	93.4
24	22.6	08.2	74	69.5	25.3	24	116.5	42.4	74	163.5	59.5	24	210.5	76.6	74	257.5	93.7
25	23.5	08.6	75	70.5	25.7	25	117.5	42.8	75	164.4	59.9	25	211.4	77.0	75	258.4	94.1
26	24.4	08.9	76	71.4	26.0	126	118.4	43.1	176	165.4	60.2	226	212.4	77.3	276	259.4	94.4
27	25.4	09.2	77	72.4	26.3	27	119.3	43.4	77	166.3	60.5	27	213.3	77.6	77	260.3	94.7
28	26.3	09.6	78	73.3	26.7	28	120.3	43.8	78	167.3	60.9	28	214.3	78.0	78	261.2	95.1
29	27.3	09.9	79	74.2	27.0	29	121.2	44.1	79	168.2	61.2	29	215.2	78.3	79	262.2	95.4
30	28.2	10.3	80	75.2	27.4	30	122.2	44.5	80	169.1	61.6	30	216.1	78.7	80	263.1	95.8
31	29.1	10.6	81	76.1	27.7	131	123.1	44.8	181	170.1	61.9	231	217.1	79.0	281	264.1	96.1
32	30.1	10.9	82	77.1	28.0	32	124.0	45.1	82	171.0	62.2	32	218.0	79.3	82	265.0	96.4
33	31.0	11.3	83	78.0	28.4	33	125.0	45.5	83	172.0	62.6	33	219.0	79.7	83	265.9	96.8
34	31.9	11.6	84	78.9	28.7	34	125.9	45.8	84	172.9	62.9	34	219.9	80.0	84	266.9	97.1
35	32.9	12.0	85	79.9	29.1	35	126.9	46.2	85	173.8	63.3	35	220.8	80.4	85	267.8	97.5
36	33.8	12.3	86	80.8	29.4	136	127.8	46.5	186	174.8	63.6	236	221.8	80.7	286	268.8	97.8
37	34.8	12.7	87	81.8	29.8	37	128.7	46.9	87	175.7	64.0	37	222.7	81.1	87	269.7	98.2
38	35.7	13.0	88	82.7	30.1	38	129.7	47.2	88	176.7	64.3	38	223.6	81.4	88	270.6	98.5
39	36.6	13.3	89	83.6	30.4	39	130.6	47.5	89	177.6	64.6	39	224.6	81.7	89	271.6	98.8
40	37.6	13.7	90	84.6	30.8	40	131.6	47.9	90	178.5	65.0	40	225.5	82.1	90	272.5	99.2
41	38.5	14.0	91	85.5	31.1	141	132.5	48.2	191	179.5	65.3	241	226.5	82.4	291	273.5	99.5
42	39.5	14.4	92	86.5	31.5	42	133.4	48.6	92	180.4	65.7	42	227.4	82.8	92	274.4	99.9
43	40.4	14.7	93	87.4	31.8	43	134.4	48.9	93	181.4	66.0	43	228.3	83.1	93	275.3	100.2
44	41.3	15.0	94	88.3	32.1	44	135.3	49.2	94	182.3	66.3	44	229.3	83.4	94	276.3	100.5
45	42.3	15.4	95	89.3	32.5	45	136.3	49.6	95	183.2	66.7	45	230.2	83.8	95	277.2	100.9
46	43.2	15.7	96	90.2	32.8	146	137.2	49.9	196	184.2	67.0	246	231.2	84.1	296	278.2	101.1
47	44.2	16.1	97	91.2	33.2	47	138.1	50.3	97	185.1	67.4	47	232.1	84.5	97	279.1	101.6
48	45.1	16.4	98	92.1	33.5	48	139.1	50.6	98	186.1	67.7	48	233.0	84.8	98	280.0	101.9
49	46.0	16.8	99	93.0	33.9	49	140.0	51.0	99	187.0	68.1	49	234.0	85.2	99	281.0	102.3
50	47.0	17.1	100	94.0	34.2	150	141.0	51.3	200	187.9	68.4	250	234.9	85.4	300	281.9	102.6
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for 70 Deg.



# Difference of Latitude and Departure for 21 Deg.

21

Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep
1	00.9	00.4	51	47.6	18.3	01	94.3	36.2	151	141.0	54.1	201	187.6	72.0	251	234.3	90.0
2	01.9	00.7	52	48.5	18.6	02	95.3	36.6	52	141.9	54.5	02	188.6	72.4	52	235.3	90.3
3	02.8	01.1	53	49.5	19.0	03	96.2	36.9	53	142.9	54.8	03	189.5	72.8	53	236.2	90.7
4	03.7	01.4	54	50.4	19.4	04	97.1	37.3	54	143.8	55.2	04	190.4	73.1	54	237.1	91.0
5	04.7	01.8	55	51.3	19.7	05	98.1	37.6	55	144.7	55.6	05	191.4	73.5	55	238.1	91.4
6	05.6	02.2	56	52.3	20.1	06	99.0	38.0	56	145.7	55.9	06	192.3	73.8	56	239.0	91.8
7	06.5	02.5	57	53.2	20.4	07	99.9	38.3	57	146.6	56.3	07	193.2	74.2	57	239.9	92.1
8	07.5	02.9	58	54.1	20.8	08	100.9	38.7	58	147.5	56.6	08	194.2	74.5	58	240.9	92.5
9	08.4	03.2	59	55.1	21.1	09	101.8	39.1	59	148.5	57.0	09	195.1	74.9	59	241.8	92.8
10	09.3	03.6	60	56.0	21.5	10	102.7	39.4	60	149.4	57.3	10	196.0	75.3	60	242.7	93.2
11	10.3	03.9	61	56.9	21.9	11	103.7	39.8	61	150.3	57.7	11	197.0	75.6	61	243.7	93.5
12	11.2	04.3	62	57.9	22.2	12	104.6	40.1	62	151.3	58.1	12	197.9	76.0	62	244.6	93.9
13	12.1	04.7	63	58.8	22.6	13	105.5	40.5	63	152.2	58.4	13	198.8	76.3	63	245.5	94.3
14	13.1	05.0	64	59.7	22.9	14	106.5	40.9	64	153.1	58.8	14	199.8	76.7	64	246.5	94.6
15	14.0	05.4	65	60.7	23.3	15	107.4	41.2	65	154.1	59.1	15	200.7	77.1	65	247.4	95.0
16	14.9	05.7	66	61.6	23.7	16	108.3	41.6	66	155.0	59.5	16	201.6	77.4	66	248.3	95.3
17	15.9	06.1	67	62.5	24.0	17	109.3	41.9	67	155.9	59.9	17	202.6	77.8	67	249.3	95.7
18	16.8	06.5	68	63.5	24.4	18	110.2	42.3	68	156.9	60.2	18	203.5	78.1	68	250.2	96.1
19	17.7	06.8	69	64.4	24.7	19	111.1	42.6	69	157.8	60.6	19	204.4	78.5	69	251.1	96.4
20	18.7	07.2	70	65.3	25.1	20	112.1	43.0	70	158.7	60.9	20	205.4	78.8	70	252.1	96.8
21	19.6	07.5	71	66.3	25.4	21	113.0	43.4	71	159.7	61.3	21	206.3	79.2	71	253.0	97.1
22	20.5	07.9	72	67.2	25.8	22	113.9	43.7	72	160.6	61.6	22	207.2	79.6	72	253.9	97.5
23	21.5	08.2	73	68.1	26.2	23	114.9	44.1	73	161.5	62.0	23	208.2	79.9	73	254.9	97.8
24	22.4	08.6	74	69.1	26.5	24	115.8	44.4	74	162.5	62.4	24	209.1	80.3	74	255.8	98.2
25	23.3	09.0	75	70.0	26.9	25	116.7	44.8	75	163.4	62.7	25	210.0	80.6	75	256.7	98.6
26	24.3	09.3	76	70.9	27.2	26	117.7	45.2	76	164.3	63.1	26	211.0	81.0	76	257.7	98.9
27	25.2	09.7	77	71.9	27.6	27	118.6	45.5	77	165.3	63.4	27	211.9	81.4	77	258.6	99.3
28	26.1	10.0	78	72.8	28.0	28	119.5	45.9	78	166.2	63.8	28	212.8	81.7	78	259.5	99.6
29	27.1	10.4	79	73.7	28.3	29	120.5	46.2	79	167.1	64.2	29	213.8	82.1	79	260.5	100.0
30	28.0	10.8	80	74.7	28.7	30	121.4	46.6	80	168.1	64.5	30	214.7	82.4	80	261.4	100.4
31	28.9	11.1	81	75.6	29.0	31	122.3	47.0	81	169.0	64.9	31	215.6	82.8	81	262.3	100.7
32	29.9	11.5	82	76.5	29.4	32	123.3	47.3	82	169.9	65.2	32	216.6	83.1	82	263.3	101.1
33	30.8	11.8	83	77.5	29.7	33	124.2	47.7	83	170.9	65.6	33	217.5	83.5	83	264.2	101.4
34	31.7	12.2	84	78.4	30.1	34	125.1	48.0	84	171.8	65.9	34	218.4	83.9	84	265.1	101.8
35	32.7	12.5	85	79.3	30.5	35	126.1	48.4	85	172.7	66.3	35	219.4	84.2	85	266.1	102.1
36	33.6	12.9	86	80.3	30.8	36	127.0	48.7	86	173.7	66.7	36	220.3	84.6	86	267.0	102.5
37	34.5	13.3	87	81.2	31.2	37	127.9	49.1	87	174.6	67.0	37	221.2	84.9	87	267.9	102.9
38	35.5	13.6	88	82.1	31.5	38	128.9	49.5	88	175.5	67.4	38	222.2	85.3	88	268.9	103.2
39	36.4	14.0	89	83.1	31.9	39	129.8	49.8	89	176.5	67.7	39	223.1	85.7	89	269.8	103.6
40	37.3	14.3	90	84.0	32.3	40	130.7	50.2	90	177.4	68.1	40	224.1	86.0	90	270.7	103.9
41	38.3	14.7	91	84.9	32.6	41	131.7	50.5	91	178.3	68.5	41	225.0	86.4	91	271.7	104.3
42	39.2	15.1	92	85.9	33.0	42	132.6	50.9	92	179.3	68.8	42	225.9	86.7	92	272.6	104.7
43	40.1	15.4	93	86.8	33.3	43	133.5	51.3	93	180.2	69.2	43	226.9	87.1	93	273.5	105.0
44	41.1	15.8	94	87.7	33.7	44	134.5	51.6	94	181.1	69.5	44	227.8	87.4	94	274.5	105.4
45	42.0	16.2	95	88.7	34.0	45	135.4	52.0	95	182.1	69.9	45	228.7	87.8	95	275.4	105.7
46	42.9	16.5	96	89.6	34.4	46	136.3	52.3	96	183.0	70.2	46	229.7	88.2	96	276.3	106.1
47	43.9	16.8	97	90.5	34.8	47	137.3	52.7	97	183.9	70.6	47	230.6	88.5	97	277.3	106.4
48	44.8	17.2	98	91.5	35.1	48	138.2	53.0	98	184.9	71.0	48	231.5	88.9	98	278.2	106.8
49	45.7	17.6	99	92.4	35.5	49	139.1	53.4	99	185.8	71.3	49	232.5	89.2	99	279.1	107.2
50	46.7	17.9	100	93.4	35.8	50	140.1	53.8	100	186.7	71.7	50	233.4	89.6	100	280.1	107.5
Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat

H

for 69 Deg.

22 Difference of Latitude and Departure for 22 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	47.3	19.1	101	93.6	37.8	151	140.0	56.6	201	186.4	75.3	251	232.7	94.0
2	01.9	00.7	52	48.2	19.5	02	94.6	38.2	52	140.9	56.9	02	187.3	75.7	52	233.7	94.4
3	02.8	01.1	53	49.1	19.9	03	95.5	38.6	53	141.9	57.3	03	188.2	76.0	53	234.6	94.8
4	03.7	01.5	54	50.1	20.2	04	96.4	39.0	54	142.8	57.7	04	189.1	76.4	54	235.5	95.2
5	04.6	01.9	55	51.0	20.6	05	97.4	39.3	55	143.7	58.1	05	190.1	76.8	55	236.4	95.5
6	05.6	02.2	56	51.9	21.0	106	98.3	39.7	156	144.6	58.4	206	191.0	77.2	256	237.4	95.9
7	06.5	02.6	57	52.9	21.4	07	99.2	40.1	57	145.6	58.8	07	191.9	77.5	57	238.3	96.3
8	07.4	03.0	58	53.8	21.7	08	100.1	40.5	58	146.5	59.2	08	192.9	77.9	58	239.2	96.6
9	08.3	03.4	59	54.7	22.1	09	101.1	40.8	59	147.4	59.6	09	193.8	78.3	59	240.1	97.0
10	09.3	03.7	60	55.6	22.5	10	102.0	41.2	60	148.4	59.9	10	194.7	78.7	60	241.1	97.4
11	10.2	04.1	61	56.6	22.9	111	102.9	41.6	161	149.3	60.3	211	195.6	79.0	261	242.0	97.8
12	11.1	04.5	62	57.5	23.2	12	103.8	42.0	62	150.2	60.7	12	196.6	79.4	62	242.9	98.1
13	12.1	04.9	63	58.4	23.6	13	104.8	42.3	63	151.1	61.1	13	197.5	79.8	63	243.9	98.5
14	13.0	05.2	64	59.3	24.0	14	105.7	42.7	64	152.1	61.4	14	198.4	80.2	64	244.8	98.9
15	13.9	05.6	65	60.3	24.3	15	106.6	43.1	65	153.0	61.8	15	199.3	80.5	65	245.7	99.3
16	14.8	06.0	66	61.2	24.7	116	107.6	43.5	166	153.9	62.2	216	200.3	80.9	266	246.6	99.6
17	15.8	06.4	67	62.1	25.1	17	108.5	43.8	67	154.8	62.6	17	201.2	81.3	67	247.6	100.0
18	16.7	06.7	68	63.0	25.5	18	109.4	44.2	68	155.8	62.9	18	202.1	81.7	68	248.5	100.4
19	17.6	07.1	69	64.0	25.8	19	110.3	44.6	69	156.7	63.3	19	203.1	82.0	69	249.4	100.8
20	18.5	07.5	70	64.9	26.2	20	111.3	45.0	70	157.6	63.7	20	204.0	82.4	70	250.3	101.1
21	19.5	07.9	71	65.8	26.6	121	112.2	45.3	171	158.6	64.1	221	204.9	82.8	271	251.3	101.5
22	20.4	08.2	72	66.8	27.0	22	113.1	45.7	72	159.5	64.4	22	205.8	83.2	72	252.2	101.9
23	21.3	08.6	73	67.7	27.3	23	114.0	46.1	73	160.4	64.8	23	206.7	83.5	73	253.1	102.3
24	22.3	09.0	74	68.6	27.7	24	115.0	46.5	74	161.3	65.2	24	207.7	83.9	74	254.1	102.6
25	23.2	09.4	75	69.5	28.1	25	115.9	46.8	75	162.3	65.6	25	208.6	84.3	75	255.0	103.0
26	24.1	09.7	76	70.5	28.5	126	116.8	47.2	176	163.2	65.9	226	209.5	84.7	276	255.9	103.4
27	25.0	10.1	77	71.4	28.8	27	117.8	47.6	77	164.1	66.3	27	210.5	85.0	77	256.8	103.8
28	26.0	10.5	78	72.3	29.2	28	118.7	47.9	78	165.0	66.7	28	211.4	85.4	78	257.8	104.1
29	26.9	10.9	79	73.2	29.6	29	119.6	48.3	79	166.0	67.1	29	212.3	85.8	79	258.7	104.5
30	27.8	11.2	80	74.2	30.0	30	120.5	48.7	80	166.9	67.4	30	213.3	86.2	80	259.6	104.9
31	28.7	11.6	81	75.1	30.3	131	121.5	49.1	181	167.8	67.8	231	214.2	86.5	281	260.5	105.3
32	29.7	12.0	82	76.0	30.7	32	122.4	49.4	82	168.8	68.2	32	215.1	86.9	82	261.5	105.6
33	30.6	12.4	83	77.0	31.1	33	123.3	49.8	83	169.7	68.6	33	216.0	87.3	83	262.4	106.0
34	31.5	12.7	84	77.9	31.5	34	124.2	50.2	84	170.6	68.9	34	217.0	87.7	84	263.3	106.4
35	32.5	13.1	85	78.8	31.8	35	125.2	50.6	85	171.5	69.3	35	217.9	88.0	85	264.3	106.8
36	33.4	13.5	86	79.7	32.2	136	126.1	50.9	186	172.5	69.7	236	218.8	88.4	286	265.2	107.1
37	34.3	13.9	87	80.7	32.6	37	127.0	51.3	87	173.4	70.1	37	219.7	88.8	87	266.1	107.5
38	35.2	14.2	88	81.6	33.0	38	128.0	51.7	88	174.3	70.4	38	220.7	89.2	88	267.0	107.9
39	36.2	14.6	89	82.5	33.3	39	128.9	52.1	89	175.2	70.8	39	221.6	89.5	89	268.0	108.3
40	37.1	15.0	90	83.4	33.7	40	129.8	52.4	90	176.2	71.2	40	222.5	89.9	90	268.9	108.6
41	38.0	15.4	91	84.4	34.1	141	130.7	52.8	191	177.1	71.5	241	223.5	90.3	291	269.8	109.0
42	38.9	15.7	92	85.3	34.5	42	131.7	53.2	92	178.0	71.9	42	224.4	90.7	92	270.7	109.4
43	39.9	16.1	93	86.2	34.8	43	132.6	53.6	93	178.9	72.3	43	225.3	91.0	93	271.7	109.8
44	40.8	16.5	94	87.2	35.2	44	133.5	53.9	94	179.8	72.7	44	226.2	91.4	94	272.6	110.1
45	41.7	16.9	95	88.1	35.6	45	134.4	54.3	95	180.8	73.0	45	227.2	91.8	95	273.5	110.5
46	42.6	17.2	96	89.0	36.0	146	135.4	54.7	196	181.7	73.4	246	228.1	92.2	296	274.5	110.9
47	43.7	17.6	97	89.9	36.3	47	136.3	55.1	97	182.7	73.8	47	229.0	92.5	97	275.4	111.3
48	44.5	18.0	98	90.9	36.7	48	137.2	55.4	98	183.6	74.2	48	229.9	92.9	98	276.3	111.6
49	45.4	18.4	99	91.8	37.1	49	138.2	55.8	99	184.5	74.5	49	230.9	93.3	99	277.2	112.0
50	46.4	18.7	100	92.7	37.5	150	139.1	56.2	200	185.4	74.9	250	231.8	93.7	300	278.2	112.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 68 Deg.



# Difference of Latitude and Departure for 23 Deg.

23

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.6	00.4	51	46.9	19.9	101	93.0	39.5	151	139.0	59.0	201	185.0	78.5	251	231.0	98.1
2	01.8	00.8	52	47.9	20.3	02	93.9	39.9	52	139.9	59.4	02	185.9	78.9	52	232.0	98.5
3	02.8	01.2	53	48.8	20.7	03	94.8	40.2	53	140.8	59.8	03	186.9	79.3	53	232.9	98.8
4	03.7	01.6	54	49.7	21.1	04	95.7	40.6	54	141.8	60.2	04	187.8	79.7	54	233.8	99.2
5	04.6	02.0	55	50.6	21.5	05	96.7	41.0	55	142.7	60.6	05	188.7	80.1	55	234.7	99.6
6	05.5	02.3	56	51.5	21.9	06	97.6	41.4	56	143.6	60.9	06	189.6	80.5	56	235.6	100.0
7	06.4	02.7	57	52.5	22.3	07	98.5	41.8	57	144.5	61.3	07	190.5	80.9	57	236.6	100.4
8	07.4	03.1	58	53.4	22.7	08	99.4	42.2	58	145.4	61.7	08	191.5	81.3	58	237.5	100.8
9	08.3	03.5	59	54.3	23.1	09	100.3	42.6	59	146.4	62.1	09	192.4	81.7	59	238.4	101.2
10	09.2	03.9	60	55.2	23.4	10	101.3	43.0	60	147.3	62.5	10	193.3	82.0	60	239.3	101.6
11	10.1	04.3	61	56.1	23.8	11	102.2	43.4	61	148.2	62.9	11	194.2	82.4	61	240.2	102.0
12	11.0	04.7	62	57.1	24.2	12	103.1	43.8	62	149.1	63.3	12	195.1	82.8	62	241.2	102.4
13	12.0	05.1	63	58.0	24.6	13	104.0	44.1	63	150.0	63.7	13	196.1	83.2	63	242.1	102.8
14	12.9	05.5	64	58.9	25.0	14	104.9	44.5	64	151.0	64.1	14	197.0	83.6	64	243.0	103.1
15	13.8	05.9	65	59.8	25.4	15	105.9	44.9	65	151.9	64.5	15	197.9	84.0	65	243.9	103.5
16	14.7	06.3	66	60.8	25.8	16	106.8	45.3	66	152.8	64.9	16	198.9	84.4	66	244.9	103.9
17	15.6	06.6	67	61.7	26.2	17	107.7	45.7	67	153.7	65.2	17	199.8	84.8	67	245.8	104.3
18	16.6	07.0	68	62.6	26.6	18	108.6	46.1	68	154.6	65.6	18	200.7	85.2	68	246.7	104.7
19	17.5	07.4	69	63.5	27.0	19	109.5	46.5	69	155.6	66.0	19	201.6	85.6	69	247.6	105.1
20	18.4	07.8	70	64.4	27.3	20	110.5	46.9	70	156.5	66.4	20	202.5	86.0	70	248.5	105.5
21	19.3	08.2	71	65.4	27.7	21	111.4	47.3	71	157.4	66.8	21	203.4	86.3	71	249.5	105.9
22	20.3	08.6	72	66.3	28.1	22	112.3	47.7	72	158.3	67.2	22	204.4	86.7	72	250.4	106.3
23	21.2	09.0	73	67.2	28.5	23	113.2	48.1	73	159.2	67.6	23	205.3	87.1	73	251.3	106.7
24	22.1	09.4	74	68.1	28.9	24	114.1	48.4	74	160.2	68.0	24	206.2	87.5	74	252.2	107.1
25	23.0	09.8	75	69.0	29.3	25	115.1	48.8	75	161.1	68.4	25	207.1	87.9	75	253.1	107.4
26	23.9	10.2	76	70.0	29.7	26	116.0	49.2	76	162.0	68.8	26	208.0	88.3	76	254.1	107.8
27	24.9	10.5	77	70.9	30.1	27	116.9	49.6	77	162.9	69.2	27	209.0	88.7	77	255.0	108.2
28	25.8	10.9	78	71.8	30.5	28	117.8	50.0	78	163.8	69.5	28	209.9	89.1	78	255.9	108.6
29	26.7	11.3	79	72.7	30.9	29	118.7	50.4	79	164.8	69.9	29	210.8	89.5	79	256.8	109.0
30	27.6	11.7	80	73.6	31.3	30	119.7	50.8	80	165.7	70.3	30	211.7	89.9	80	257.7	109.4
31	28.5	12.1	81	74.6	31.6	31	120.6	51.2	81	166.6	70.7	31	212.6	90.3	81	258.7	109.8
32	29.5	12.5	82	75.5	32.0	32	121.5	51.6	82	167.5	71.1	32	213.6	90.6	82	259.6	110.2
33	30.4	12.9	83	76.4	32.4	33	122.4	52.0	83	168.5	71.5	33	214.5	91.0	83	260.5	110.6
34	31.3	13.3	84	77.3	32.8	34	123.3	52.4	84	169.4	71.9	34	215.4	91.4	84	261.4	111.0
35	32.2	13.7	85	78.2	33.2	35	124.3	52.7	85	170.3	72.3	35	216.3	91.8	85	262.3	111.3
36	33.1	14.1	86	79.2	33.6	36	125.2	53.1	86	171.2	72.7	36	217.2	92.2	86	263.3	111.7
37	34.1	14.5	87	80.1	34.0	37	126.1	53.5	87	172.1	73.1	37	218.2	92.6	87	264.2	112.1
38	35.0	14.8	88	81.0	34.4	38	127.0	53.9	88	173.1	73.5	38	219.1	93.0	88	265.1	112.5
39	35.9	15.2	89	81.9	34.8	39	127.9	54.3	89	174.0	73.8	39	220.0	93.4	89	266.0	112.9
40	36.8	15.6	90	82.8	35.2	40	128.9	54.7	90	174.9	74.2	40	220.9	93.8	90	266.9	113.3
41	37.7	16.0	91	83.8	35.6	41	129.8	55.1	91	175.8	74.6	41	221.8	94.2	91	267.9	113.7
42	38.7	16.4	92	84.7	35.9	42	130.7	55.5	92	176.7	75.0	42	222.8	94.5	92	268.8	114.1
43	39.6	16.8	93	85.6	36.3	43	131.6	55.9	93	177.7	75.4	43	223.7	94.9	93	269.7	114.5
44	40.5	17.2	94	86.5	36.7	44	132.6	56.3	94	178.6	75.8	44	224.6	95.3	94	270.6	114.9
45	41.4	17.6	95	87.4	37.1	45	133.5	56.7	95	179.5	76.2	45	225.5	95.7	95	271.5	115.3
46	42.3	18.0	96	88.4	37.5	46	134.4	57.0	96	180.4	76.6	46	226.4	96.1	96	272.5	115.6
47	43.3	18.4	97	89.3	37.9	47	135.3	57.4	97	181.3	77.0	47	227.4	96.5	97	273.4	116.0
48	44.2	18.8	98	90.2	38.3	48	136.2	57.8	98	182.3	77.4	48	228.3	96.9	98	274.3	116.4
49	45.1	19.1	99	91.1	38.7	49	137.2	58.2	99	183.2	77.7	49	229.2	97.3	99	275.2	116.8
50	46.0	19.5	100	92.0	39.1	50	138.1	58.6	100	184.1	78.1	50	230.1	97.7	100	276.2	117.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 67 Deg.

# 24 Difference of Latitude and Departure for 24 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.4	51	46.6	20.7	101	92.3	41.1	151	137.9	61.4	201	183.6	81.7	251	229.3	102.1
2	01.8	00.8	52	47.5	21.1	02	93.2	41.5	52	138.9	61.8	02	184.5	82.2	52	230.2	102.5
3	02.7	01.2	53	48.4	21.6	03	94.1	41.9	53	139.8	62.2	03	185.4	82.6	53	231.1	102.9
4	03.7	01.6	54	49.3	22.0	04	95.0	42.3	54	140.7	62.6	04	186.4	83.0	54	232.0	103.3
5	04.6	02.0	55	50.2	22.4	05	95.9	42.7	55	141.6	63.0	05	187.3	83.4	55	232.9	103.7
6	05.5	02.4	56	51.2	22.8	106	96.8	43.1	156	142.5	63.4	206	188.2	83.8	256	233.9	104.1
7	06.4	02.8	57	52.1	23.2	07	97.7	43.5	57	143.4	63.9	07	189.1	84.2	57	234.8	104.5
8	07.3	03.3	58	53.0	23.6	08	98.7	43.9	58	144.3	64.3	08	190.0	84.6	58	235.7	104.9
9	08.2	03.7	59	53.9	24.0	09	99.6	44.3	59	145.2	64.7	09	190.9	85.0	59	236.6	105.3
10	09.1	04.1	60	54.8	24.4	10	100.5	44.7	60	146.2	65.1	10	191.8	85.4	60	237.5	105.7
11	10.0	04.5	61	55.7	24.8	111	101.4	45.1	161	147.1	65.5	211	192.7	85.8	261	238.4	106.1
12	11.0	04.9	62	56.6	25.2	12	102.3	45.6	62	148.0	65.9	12	193.7	86.2	62	239.3	106.6
13	11.9	05.3	63	57.6	25.6	13	103.2	46.0	63	148.9	66.3	13	194.6	86.6	63	240.3	107.0
14	12.8	05.7	64	58.5	26.0	14	104.1	46.4	64	149.8	66.7	14	195.5	87.0	64	241.2	107.4
15	13.7	06.1	65	59.4	26.4	15	105.1	46.8	65	150.7	67.1	15	196.4	87.4	65	242.1	107.8
16	14.6	06.5	66	60.3	26.8	116	106.0	47.2	166	151.6	67.5	216	197.3	87.8	266	243.0	108.2
17	15.5	06.9	67	61.2	27.2	17	106.9	47.6	67	152.6	67.9	17	198.2	88.3	67	243.9	108.6
18	16.4	07.3	68	62.1	27.7	18	107.8	48.0	68	153.5	68.3	18	199.1	88.7	68	244.8	109.0
19	17.4	07.7	69	63.0	28.1	19	108.7	48.4	69	154.4	68.7	19	200.1	89.1	69	245.7	109.4
20	18.3	08.1	70	63.9	28.5	20	109.6	48.8	70	155.3	69.1	20	201.0	89.5	70	246.6	109.8
21	19.2	08.5	71	64.9	28.9	121	110.5	49.2	171	156.2	69.5	221	201.9	99.9	271	247.6	110.2
22	20.1	08.9	72	65.8	29.3	22	111.4	49.6	72	157.1	70.0	22	202.8	90.3	72	248.5	110.6
23	21.0	09.4	73	66.7	29.7	23	112.4	50.0	73	158.0	70.4	23	203.7	90.7	73	249.4	111.0
24	21.9	09.8	74	67.6	30.1	24	113.3	50.4	74	158.9	70.8	24	204.6	91.1	74	250.3	111.4
25	22.8	10.2	75	68.5	30.5	25	114.2	50.8	75	159.9	71.2	25	205.5	91.5	75	251.2	111.8
26	23.8	10.6	76	69.4	30.9	126	115.1	51.2	176	160.8	71.6	226	206.5	91.9	276	252.1	112.2
27	24.7	11.0	77	70.3	31.3	27	116.0	51.7	77	161.7	72.0	27	207.4	92.3	77	253.0	112.7
28	25.6	11.4	78	71.3	31.7	28	116.9	52.1	78	162.6	72.4	28	208.3	92.7	78	254.0	113.1
29	26.5	11.8	79	72.2	32.1	29	117.8	52.5	79	163.5	72.8	29	209.2	93.1	79	254.9	113.5
30	27.4	12.2	80	73.1	32.5	30	118.8	52.9	80	164.4	73.2	30	210.1	93.5	80	255.8	113.9
31	28.3	12.6	81	74.0	32.9	131	119.7	53.3	181	165.3	73.6	231	211.0	93.9	281	256.7	114.3
32	29.2	13.0	82	74.9	33.3	32	120.6	53.7	82	166.3	74.0	32	211.9	94.4	82	257.6	114.7
33	30.1	13.4	83	75.8	33.8	33	121.5	54.1	83	167.2	74.4	33	212.8	94.8	83	258.5	115.1
34	31.1	13.8	84	76.7	34.2	34	122.4	54.5	84	168.1	74.8	34	213.8	95.2	84	259.4	115.5
35	32.0	14.2	85	77.6	34.6	35	123.3	54.9	85	169.0	75.2	35	214.7	95.6	85	260.3	115.9
36	32.9	14.6	86	78.6	35.0	136	124.2	55.3	186	169.9	75.6	236	215.6	96.0	286	261.3	116.3
37	33.8	15.0	87	79.5	35.4	37	125.1	55.7	87	170.8	76.1	37	216.5	96.4	87	262.2	116.7
38	34.7	15.5	88	80.4	35.8	38	126.1	56.1	88	171.7	76.5	38	217.4	96.8	88	263.1	117.1
39	35.6	15.9	89	81.3	36.2	39	127.0	56.5	89	172.7	76.9	39	218.3	97.2	89	264.0	117.5
40	36.5	16.3	90	82.2	36.6	40	127.9	56.9	90	173.6	77.3	40	219.2	97.6	90	264.9	117.9
41	37.5	16.7	91	83.1	37.0	141	128.8	57.3	191	174.5	77.7	241	220.2	98.0	291	265.8	118.3
42	38.4	17.1	92	84.0	37.4	42	129.7	57.8	92	175.4	78.1	42	221.1	98.4	92	266.7	118.8
43	39.3	17.5	93	85.0	37.8	43	130.6	58.2	93	176.3	78.5	43	222.0	98.8	93	267.7	119.2
44	40.2	17.9	94	85.9	38.2	44	131.5	58.6	94	177.2	78.9	44	222.9	99.2	94	268.6	119.6
45	41.1	18.3	95	86.8	38.6	45	132.5	59.0	95	178.1	79.3	45	223.8	99.6	95	269.5	120.0
46	42.0	18.7	96	87.7	39.0	146	133.4	59.4	196	179.0	79.7	246	224.7	100.0	296	270.4	120.4
47	42.9	19.1	97	88.6	39.4	47	134.3	59.8	97	180.0	80.1	47	225.6	100.5	97	271.3	120.8
48	43.8	19.5	98	89.5	39.9	48	135.2	60.2	98	180.9	80.5	48	226.5	100.9	98	272.2	121.2
49	44.8	19.9	99	90.4	40.3	49	136.1	60.6	99	181.8	80.9	49	227.5	101.3	99	273.1	121.6
50	45.7	20.3	100	91.4	40.7	150	137.0	61.0	200	182.7	81.3	250	228.4	101.7	300	274.1	122.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 66 Deg.



# Difference of Latitude and Departure for 25 Deg. 25

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.0	00.4	51	46.2	21.6	101	91.5	42.7	151	136.5	63.8	201	182.2	84.9	251	227.5	106.1
2	01.8	00.8	52	47.1	22.0	02	92.4	43.1	52	137.8	64.2	02	183.1	85.4	52	228.4	106.5
3	02.7	01.3	53	48.0	22.4	03	93.3	43.5	53	138.7	64.7	03	184.0	85.8	53	229.3	106.9
4	03.6	01.7	54	48.9	22.8	04	94.3	44.0	54	139.6	65.1	04	184.9	86.2	54	230.2	107.3
5	04.5	02.1	55	49.8	23.2	05	95.2	44.4	55	140.5	65.5	05	185.8	86.6	55	231.1	107.8
6	05.4	02.5	56	50.8	23.7	106	96.1	44.8	156	141.4	65.9	206	186.7	87.1	256	232.0	108.2
7	06.3	03.0	57	51.7	24.1	07	97.0	45.2	57	142.3	66.3	07	187.6	87.5	57	232.9	108.6
8	07.3	03.4	58	52.6	24.5	08	97.9	45.6	58	143.2	66.8	08	188.5	87.9	58	233.8	109.0
9	08.2	03.8	59	53.5	24.9	09	98.8	46.1	59	144.1	67.2	09	189.4	88.3	59	234.7	109.5
10	09.1	04.2	60	54.4	25.4	10	99.7	46.5	60	145.0	67.6	10	190.3	88.7	60	235.6	109.9
11	10.0	04.6	61	55.3	25.8	111	100.6	46.9	161	145.9	68.0	211	191.2	89.2	261	236.5	110.3
12	10.9	05.0	62	56.2	26.2	12	101.5	47.3	62	146.8	68.5	12	192.1	89.6	62	237.5	110.7
13	11.8	05.5	63	57.1	26.6	13	102.4	47.8	63	147.7	68.9	13	193.0	90.0	63	238.4	111.1
14	12.7	05.9	64	58.0	27.0	14	103.3	48.2	64	148.6	69.3	14	193.9	90.4	64	239.3	111.6
15	13.6	06.3	65	58.9	27.5	15	104.2	48.6	65	149.5	69.7	15	194.8	90.9	65	240.2	112.0
16	14.5	06.8	66	59.8	27.9	116	105.1	49.0	166	150.4	70.2	216	195.8	91.3	266	241.1	112.4
17	15.4	07.2	67	60.7	28.3	17	106.0	49.4	67	151.4	70.6	17	196.7	91.7	67	242.0	112.8
18	16.3	07.6	68	61.6	28.7	18	106.9	49.9	68	152.3	71.0	18	197.6	92.1	68	242.9	113.3
19	17.2	08.0	69	62.5	29.2	19	107.8	50.3	69	153.2	71.4	19	198.5	92.5	69	243.8	113.7
20	18.1	08.5	70	63.4	29.6	20	108.8	50.7	70	154.1	71.8	20	199.4	93.0	70	244.7	114.1
21	19.0	08.9	71	64.3	30.0	121	109.7	51.1	171	155.0	72.3	221	200.3	93.4	271	245.6	114.5
22	19.9	09.3	72	65.3	30.4	22	110.6	51.6	72	155.9	72.7	22	201.2	93.8	72	246.5	114.9
23	20.8	09.7	73	66.2	30.8	23	111.5	52.0	73	156.8	73.1	23	202.1	94.2	73	247.4	115.4
24	21.8	10.1	74	67.1	31.3	24	112.4	52.4	74	157.7	73.5	24	203.0	94.7	74	248.3	115.8
25	22.7	10.6	75	68.0	31.7	25	113.3	52.8	75	158.6	74.0	25	203.9	95.1	75	249.2	116.2
26	23.6	11.0	76	68.9	32.1	126	114.2	53.2	176	159.5	74.4	226	204.8	95.5	276	250.1	116.6
27	24.5	11.4	77	69.8	32.5	27	115.1	53.7	77	160.4	74.8	27	205.7	95.0	77	251.0	117.1
28	25.4	11.8	78	70.7	33.0	28	116.0	54.1	78	161.3	75.2	28	206.6	96.4	78	252.0	117.5
29	26.3	12.3	79	71.6	33.4	29	116.9	54.5	79	162.2	75.6	29	207.5	96.8	79	252.9	117.9
30	27.2	12.7	80	72.5	33.8	30	117.8	54.9	80	163.1	76.1	30	208.4	97.2	80	253.8	118.3
31	28.1	13.1	81	73.4	34.2	131	118.7	55.4	181	164.0	76.5	231	209.4	97.6	281	254.7	118.8
32	29.0	13.5	82	74.3	34.7	32	119.6	55.8	82	164.9	76.9	32	210.3	98.0	82	255.6	119.2
33	29.9	13.9	83	75.2	35.1	33	120.5	56.2	83	165.9	77.3	33	211.2	98.5	83	256.5	119.6
34	30.8	14.4	84	76.1	35.5	34	121.4	56.6	84	166.8	77.8	34	212.1	98.9	84	257.4	120.0
35	31.7	14.8	85	77.0	35.9	35	122.4	57.1	85	167.7	78.2	35	213.0	99.3	85	258.3	120.4
36	32.6	15.2	86	77.9	36.3	136	123.3	57.5	186	168.6	78.6	236	213.9	99.7	286	259.2	120.9
37	33.5	15.6	87	78.8	36.8	37	124.2	57.9	87	169.5	79.0	37	214.8	100.2	87	260.1	121.3
38	34.4	16.1	88	79.8	37.2	38	125.1	58.3	88	170.4	79.4	38	215.7	100.6	88	261.0	121.7
39	35.3	16.5	89	80.7	37.6	39	126.0	58.7	89	171.3	79.9	39	216.6	101.0	89	261.9	122.1
40	36.3	16.9	90	81.6	38.0	40	126.9	59.2	90	172.2	80.3	40	217.5	101.4	90	262.8	122.6
41	37.2	17.3	91	82.5	38.5	141	127.8	59.6	191	173.1	80.7	241	218.4	101.8	291	263.7	123.0
42	38.1	17.7	92	83.4	38.9	42	128.7	60.0	92	174.0	81.1	42	219.3	102.3	92	264.6	123.4
43	39.0	18.2	93	84.3	39.3	43	129.6	60.4	93	174.9	81.6	43	220.2	102.7	93	265.5	123.8
44	39.9	18.6	94	85.2	39.7	44	130.5	60.9	94	175.8	82.0	44	221.1	103.1	94	266.5	124.2
45	40.8	19.0	95	86.1	40.1	45	131.4	61.3	95	176.7	82.4	45	222.0	103.5	95	267.4	124.7
46	41.7	19.4	96	87.0	40.6	146	132.3	61.7	196	177.6	82.8	246	222.9	104.0	296	268.3	125.1
47	42.6	19.9	97	87.9	41.0	47	133.2	62.1	97	178.5	83.3	47	223.9	104.4	97	269.2	125.5
48	43.5	20.3	98	88.8	41.4	48	134.1	62.5	98	179.4	83.7	48	224.8	104.8	98	270.1	125.9
49	44.4	20.7	99	89.7	41.8	49	135.0	63.0	99	180.4	84.1	49	225.7	105.2	99	271.0	126.4
50	45.3	21.1	100	90.6	42.3	150	135.9	63.4	200	181.3	84.5	250	226.6	105.7	300	271.9	126.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

# 26 Difference of Latitude and Departure for 26 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.0	00.4	51	45.8	22.4	101	90.8	44.3	151	135.7	66.2	201	180.7	88.1	251	225.6	110.0
2	01.8	00.9	52	46.7	22.8	02	91.7	44.7	52	136.6	66.6	02	181.6	88.6	52	226.5	110.5
3	02.7	01.3	53	47.6	23.2	03	92.6	45.2	53	137.5	67.1	03	182.5	89.0	53	227.4	110.9
4	03.6	01.8	54	48.5	23.7	04	93.5	45.6	54	138.4	67.5	04	183.4	89.4	54	228.3	111.4
5	04.5	02.2	55	49.4	24.1	05	94.4	46.0	55	139.3	68.0	05	184.3	89.9	55	229.2	111.8
6	05.4	02.6	56	50.3	24.6	106	95.3	46.5	156	140.2	68.4	206	185.2	90.3	256	230.1	112.2
7	06.3	03.1	57	51.2	25.0	07	96.2	46.9	57	141.1	68.8	07	186.1	90.7	57	231.0	112.7
8	07.2	03.5	58	52.1	25.4	08	97.1	47.3	58	142.0	69.3	08	187.0	91.2	58	231.9	113.1
9	08.1	03.9	59	53.0	25.9	09	98.0	47.8	59	142.9	69.7	09	187.8	91.6	59	232.8	113.5
10	09.0	04.4	60	53.9	26.3	10	98.9	48.2	60	143.8	70.1	10	188.7	92.1	60	233.7	114.0
11	09.9	04.8	61	54.8	26.7	111	99.8	48.7	161	144.7	70.6	211	189.6	92.5	261	234.6	114.4
12	10.8	05.3	62	55.7	27.2	12	100.7	49.1	62	145.6	71.0	12	190.5	92.9	62	235.5	114.9
13	11.7	05.7	63	56.6	27.6	13	101.6	49.5	63	146.5	71.5	13	191.4	92.4	63	236.4	115.3
14	12.6	06.1	64	57.5	28.1	14	102.5	50.0	64	147.4	71.9	14	192.3	93.8	64	237.3	115.7
15	13.5	06.6	65	58.4	28.5	15	103.4	50.4	65	148.3	72.3	15	193.2	94.3	65	238.2	116.2
16	14.4	07.0	66	59.3	28.9	116	104.3	50.9	166	149.2	72.8	216	194.1	94.7	266	239.1	116.6
17	15.3	07.5	67	60.2	29.4	17	105.2	51.3	67	150.1	73.2	17	195.0	95.1	67	240.0	117.1
18	16.2	07.9	68	61.1	29.8	18	106.1	51.7	68	151.0	73.7	18	195.9	95.6	68	240.9	117.5
19	17.1	08.3	69	62.0	30.2	19	107.0	52.2	69	151.9	74.1	19	196.8	96.0	69	241.8	117.9
20	18.0	08.7	70	62.9	30.7	20	107.9	52.6	70	152.8	74.5	20	197.7	96.4	70	242.7	118.4
21	18.9	09.2	71	63.8	31.1	121	108.8	53.0	171	153.7	75.0	221	198.6	96.9	271	243.6	118.8
22	19.8	09.6	72	64.7	31.6	22	109.7	53.5	72	154.6	75.4	22	199.5	97.3	72	244.5	119.2
23	20.7	10.1	73	65.6	32.0	23	110.6	53.9	73	155.5	75.8	23	200.4	97.8	73	245.4	119.7
24	21.6	10.5	74	66.5	32.4	24	111.5	54.4	74	156.4	76.3	24	201.3	98.2	74	246.3	120.1
25	22.5	11.0	75	67.4	32.9	25	112.4	54.8	75	157.3	76.7	25	202.2	98.6	75	247.2	120.6
26	23.4	11.4	76	68.3	33.3	126	113.2	55.2	176	158.2	77.2	226	203.1	99.1	276	248.1	121.0
27	24.3	11.8	77	69.2	33.8	27	114.1	55.7	77	159.1	77.6	27	204.0	99.5	77	249.0	121.4
28	25.2	12.3	78	70.1	34.2	28	115.0	56.1	78	160.0	78.0	28	204.9	100.0	78	249.9	121.9
29	26.1	12.7	79	71.0	34.6	29	115.9	56.6	79	160.9	78.5	29	205.8	100.4	79	250.8	122.3
30	27.0	13.2	80	71.9	35.1	30	116.8	57.0	80	161.8	78.9	30	206.7	100.8	80	251.7	122.8
31	27.9	13.6	81	72.8	35.5	131	117.7	57.4	181	162.7	79.4	231	207.6	101.3	281	252.6	123.2
32	28.8	14.0	82	73.7	35.9	32	118.6	57.9	82	163.6	79.8	32	208.5	101.7	82	253.5	123.6
33	29.7	14.5	83	74.6	36.4	33	119.5	58.3	83	164.5	80.2	33	209.4	102.1	83	254.4	124.1
34	30.6	14.9	84	75.5	36.8	34	120.4	58.7	84	165.4	80.7	34	210.3	102.6	84	255.3	124.5
35	31.5	15.3	85	76.4	37.3	35	121.3	59.2	85	166.3	81.1	35	211.2	103.0	85	256.2	124.9
36	32.4	15.8	86	77.3	37.7	136	122.2	59.6	186	167.2	81.5	236	212.1	103.5	286	257.1	125.4
37	33.3	16.2	87	78.2	38.1	37	123.1	60.1	87	168.1	82.0	37	213.0	103.9	87	258.0	125.8
38	34.2	16.7	88	79.1	38.6	38	124.0	60.5	88	169.0	82.4	38	213.9	104.3	88	258.9	126.3
39	35.1	17.1	89	80.0	39.0	39	124.9	60.9	89	169.9	82.9	39	214.8	104.8	89	259.8	126.7
40	36.0	17.5	90	80.9	39.5	40	125.8	61.4	90	170.8	83.3	40	215.7	105.2	90	260.7	127.1
41	36.9	18.0	91	81.8	39.9	141	126.7	61.8	191	171.7	83.7	241	216.6	105.7	291	261.6	127.9
42	37.7	18.4	92	82.7	40.3	42	127.6	62.2	92	172.6	84.2	42	217.5	106.1	92	262.4	128.0
43	38.6	18.9	93	83.6	40.8	43	128.5	62.7	93	173.5	84.6	43	218.4	106.5	93	263.3	128.5
44	39.5	19.3	94	84.5	41.2	44	129.4	63.1	94	174.4	85.0	44	219.3	107.0	94	264.2	128.9
45	40.4	19.7	95	85.4	41.6	45	130.3	63.6	95	175.3	85.5	45	220.2	107.4	95	265.1	129.3
46	41.3	20.2	96	86.3	42.1	146	131.2	64.0	196	176.2	85.9	246	221.1	107.8	296	266.0	129.8
47	42.2	20.6	97	87.2	42.5	47	132.1	64.4	97	177.1	86.4	47	222.0	108.3	97	266.9	130.2
48	43.1	21.0	98	88.1	43.0	48	133.0	64.9	98	178.0	86.8	48	222.9	108.7	98	267.8	130.6
49	44.0	21.5	99	89.0	43.4	49	133.9	65.3	99	178.9	87.2	49	223.8	109.2	99	268.7	131.1
50	44.9	21.9	100	89.9	43.8	150	134.8	65.8	200	179.8	87.7	250	224.7	109.6	300	269.6	131.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 64 Deg.



# Difference of Latitude and Departure for 27 Deg. 27

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	5	45.4	23.2	101	90.0	45.9	151	134.5	68.6	201	179.1	91.3	251	223.6	114.0
2	01.8	00.9	5	46.3	23.6	02	90.9	46.3	52	135.4	69.0	02	180.0	91.7	52	224.5	114.4
3	02.7	01.4	5	47.2	24.1	03	91.8	46.8	53	136.3	69.5	03	180.9	92.2	53	225.4	114.9
4	03.6	01.8	5	48.1	24.5	04	92.7	47.2	54	137.2	69.9	04	181.8	92.6	54	226.3	115.3
5	04.5	02.3	5	49.0	25.0	05	93.6	47.7	55	138.1	70.4	05	182.7	93.1	55	227.2	115.8
6	05.3	02.7	5	49.9	25.4	106	94.4	48.1	156	139.0	70.8	206	183.5	93.5	256	228.1	116.2
7	06.2	03.2	5	50.8	25.9	07	95.3	48.6	57	139.9	71.3	07	184.4	94.0	57	229.0	116.7
8	07.1	03.6	5	51.7	26.3	08	96.2	49.0	58	140.8	71.7	08	185.3	94.4	58	229.9	117.1
9	08.0	04.1	5	52.6	26.8	09	97.1	49.5	59	141.7	72.2	09	186.2	94.9	59	230.8	117.6
10	08.9	04.5	5	53.5	27.2	10	98.0	49.9	60	142.6	72.6	10	187.1	95.3	60	231.7	118.0
11	09.8	05.0	6	54.4	27.7	111	98.9	50.4	161	143.5	73.1	211	188.0	95.8	261	232.6	118.5
12	10.7	05.4	6	55.2	28.1	12	99.8	50.8	62	144.3	73.5	12	188.9	96.2	62	233.4	118.9
13	11.6	05.9	6	56.1	28.6	13	100.7	51.3	63	145.2	74.0	13	189.8	96.7	63	234.3	119.4
14	12.5	06.4	6	57.0	29.1	14	101.6	51.8	64	146.1	74.5	14	190.7	97.2	64	235.2	119.9
15	13.4	06.8	6	57.9	29.5	15	102.5	52.2	65	147.0	74.9	15	191.6	97.6	65	236.1	120.3
16	14.3	07.3	6	58.8	30.0	116	103.4	52.7	166	147.9	75.4	216	192.5	98.1	266	237.0	120.8
17	15.1	07.7	6	59.7	30.4	17	104.2	53.1	67	148.8	75.8	17	193.3	98.5	67	237.9	121.2
18	16.0	08.2	6	60.6	30.9	18	105.1	53.6	68	149.7	76.3	18	194.2	99.0	68	238.8	121.7
19	16.9	08.6	6	61.5	31.3	19	106.0	54.0	69	150.6	76.7	19	195.1	99.4	69	239.7	122.1
20	17.8	09.1	7	62.4	31.8	20	106.9	54.5	70	151.5	77.2	20	196.0	99.9	70	240.6	122.6
21	18.7	09.5	7	63.3	32.2	121	107.8	54.9	171	152.4	77.6	221	196.9	100.3	271	241.5	123.3
22	19.6	10.0	7	64.2	32.7	22	108.7	55.4	72	153.3	78.1	22	197.8	100.8	72	242.4	123.5
23	20.5	10.4	7	65.0	33.1	23	109.6	55.8	73	154.1	78.5	23	198.7	101.2	73	243.2	123.9
24	21.4	10.9	7	65.9	33.6	24	110.5	56.3	74	155.0	79.0	24	199.6	101.7	74	244.1	124.4
25	22.3	11.4	7	66.8	34.1	25	111.4	56.8	75	155.9	79.5	25	200.5	102.2	75	245.0	124.9
26	23.2	11.8	7	67.7	34.5	126	112.3	57.2	176	156.8	79.9	226	201.4	102.6	276	245.9	125.3
27	24.1	12.3	7	68.6	35.0	27	113.2	57.7	77	157.7	80.4	27	202.3	103.1	77	246.8	125.8
28	24.9	12.7	7	69.5	35.4	28	114.0	58.1	78	158.6	80.8	28	203.1	103.5	78	247.7	126.2
29	25.8	13.2	7	70.4	35.9	29	114.9	58.6	79	159.5	81.3	29	204.0	104.0	79	248.6	126.7
30	26.7	13.6	8	71.3	36.3	30	115.8	59.0	80	160.4	81.7	30	204.9	104.4	80	249.5	127.1
31	27.6	14.1	8	72.2	36.8	131	116.7	59.5	181	161.3	82.2	231	205.8	104.9	281	250.4	127.6
32	28.5	14.5	8	73.1	37.2	32	117.6	59.9	82	162.2	82.6	32	206.7	105.3	82	251.3	128.0
33	29.4	15.0	8	74.0	37.7	33	118.5	60.4	83	163.1	83.1	33	207.6	105.8	83	252.2	128.5
34	30.3	15.4	8	74.8	38.1	34	119.4	60.8	84	163.9	83.5	34	208.5	106.2	84	253.0	128.9
35	31.2	15.9	8	75.7	38.6	35	120.3	61.3	85	164.8	84.0	35	209.4	106.7	85	253.9	129.4
36	32.1	16.3	8	76.6	39.0	136	121.2	61.7	186	165.7	84.4	236	210.3	107.1	286	254.8	129.8
37	33.0	16.8	8	77.5	39.5	37	122.1	62.2	87	166.6	84.9	37	211.2	107.6	87	255.7	130.3
38	33.9	17.3	8	78.4	40.0	38	123.0	62.7	88	167.5	85.4	38	212.1	108.1	88	256.6	130.8
39	34.7	17.7	8	79.3	40.4	39	123.8	63.1	89	168.4	85.8	39	212.9	108.5	89	257.5	131.2
40	35.6	18.2	9	80.2	40.9	40	124.7	63.6	90	169.3	86.3	40	213.8	109.0	90	258.4	131.7
41	36.5	18.6	9	81.1	41.3	141	125.6	64.0	191	170.2	86.7	241	214.7	109.4	291	259.3	132.1
42	37.4	19.1	9	82.0	41.8	42	126.5	64.5	92	171.1	87.2	42	215.6	109.9	92	260.2	132.6
43	38.3	19.5	9	82.9	42.2	43	127.4	64.9	93	172.0	87.6	43	216.5	110.3	93	261.1	133.0
44	39.2	20.0	9	83.8	42.7	44	128.3	65.4	94	172.9	88.1	44	217.4	110.8	94	262.0	133.5
45	40.1	20.4	9	84.6	43.1	45	129.2	65.8	95	173.7	88.5	45	218.3	111.2	95	262.8	133.9
46	41.0	20.9	9	85.5	43.6	146	130.1	66.3	196	174.6	89.0	246	219.2	111.7	296	263.7	134.4
47	41.9	21.3	9	86.4	44.0	47	131.0	66.7	97	175.5	89.4	47	220.1	112.1	97	264.6	134.8
48	42.8	21.8	9	87.3	44.5	48	131.9	67.2	98	176.4	89.9	48	221.0	112.6	98	265.5	135.3
49	43.7	22.2	9	88.2	44.9	49	132.8	67.6	99	177.3	90.3	49	221.9	113.0	99	266.4	135.7
50	44.6	22.7	10	89.1	45.4	150	133.7	68.1	200	178.2	90.8	250	222.8	113.5	300	267.3	136.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 63 Deg.

Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep	Diff	Lat	Dep
1	00.9	00.5	51	45.0	23.9	101	89.2	47.4	151	133.3	70.9	201	177.5	94.4	251	221.6	117.8
2	01.8	00.9	52	45.9	24.4	02	90.1	47.9	52	134.2	71.4	02	178.4	94.8	52	222.5	118.3
3	02.6	01.4	53	46.8	24.9	03	90.9	48.4	53	135.1	71.8	03	179.2	95.3	53	223.4	118.8
4	03.5	01.9	54	47.7	25.4	04	91.8	48.8	54	136.0	72.3	04	180.1	95.8	54	224.3	119.2
5	04.4	02.3	55	48.6	25.8	05	92.7	49.3	55	136.9	72.8	05	181.0	96.2	55	225.2	119.7
6	05.3	02.8	56	49.4	26.3	06	93.6	49.8	56	137.7	73.2	06	181.9	96.7	56	226.0	120.2
7	06.2	03.3	57	50.3	26.8	07	94.5	50.2	57	138.6	73.7	07	182.8	97.2	57	226.9	120.7
8	07.1	03.8	58	51.2	27.2	08	95.4	50.7	58	139.5	74.2	08	183.7	97.7	58	227.8	121.1
9	07.9	04.2	59	52.1	27.7	09	96.2	51.2	59	140.4	74.6	09	184.5	98.1	59	228.7	121.6
10	08.8	04.7	60	53.0	28.2	10	97.1	51.6	60	141.3	75.1	10	185.4	98.6	60	229.6	122.1
11	09.7	05.2	61	53.9	28.6	11	98.0	52.1	61	142.2	75.6	11	186.3	99.1	61	230.5	122.5
12	10.6	05.6	62	54.7	29.1	12	98.9	52.6	62	143.0	76.1	12	187.2	99.5	62	231.3	123.0
13	11.5	06.1	63	55.6	29.6	13	99.8	53.1	63	143.9	76.5	13	188.1	100.0	63	232.2	123.5
14	12.4	06.6	64	56.5	30.0	14	100.7	53.5	64	144.8	77.0	14	189.0	100.5	64	233.1	123.9
15	13.2	07.0	65	57.4	30.5	15	101.5	54.0	65	145.7	77.5	15	189.8	100.9	65	234.0	124.4
16	14.1	07.5	66	58.3	31.0	16	102.4	54.5	66	146.6	77.9	16	190.7	101.4	66	234.9	124.9
17	15.0	08.0	67	59.2	31.5	17	103.3	54.9	67	147.5	78.4	17	191.6	101.9	67	235.8	125.4
18	15.9	08.5	68	60.0	31.9	18	104.2	55.4	68	148.3	78.9	18	192.5	102.4	68	236.6	125.8
19	16.8	08.9	69	60.9	32.4	19	105.1	55.9	69	149.2	79.3	19	193.4	102.8	69	237.5	126.3
20	17.7	09.4	70	61.8	32.9	20	106.0	56.3	70	150.1	79.8	20	194.3	103.3	70	238.4	126.8
21	18.5	09.9	71	62.7	33.3	21	106.8	56.8	71	151.0	80.3	21	195.1	103.8	71	239.3	127.2
22	19.4	10.3	72	63.6	33.8	22	107.7	57.3	72	151.9	80.8	22	196.0	104.2	72	240.2	127.7
23	20.3	10.8	73	64.5	34.3	23	108.6	57.7	73	152.8	81.2	23	196.9	104.7	73	241.1	128.2
24	21.2	11.3	74	65.3	34.7	24	109.5	58.2	74	153.6	81.7	24	197.8	105.2	74	241.9	128.6
25	22.1	11.7	75	66.2	35.2	25	110.4	58.7	75	154.5	82.2	25	198.7	105.6	75	242.8	129.1
26	23.0	12.2	76	67.1	35.7	26	111.3	59.2	76	155.4	82.6	26	199.6	106.1	76	243.7	129.6
27	23.8	12.7	77	68.0	36.2	27	112.1	59.6	77	156.3	83.1	27	200.4	106.6	77	244.6	130.1
28	24.7	13.1	78	68.9	36.6	28	113.0	60.1	78	157.2	83.6	28	201.3	107.0	78	245.5	130.5
29	25.6	13.6	79	69.8	37.1	29	113.9	60.6	79	158.1	84.0	29	202.2	107.5	79	246.4	131.0
30	26.5	14.1	80	70.6	37.6	30	114.8	61.0	80	158.9	84.5	30	203.1	108.0	80	247.2	131.5
31	27.4	14.6	81	71.5	38.0	31	115.7	61.5	81	159.8	85.0	31	204.0	108.5	81	248.1	131.9
32	28.3	15.0	82	72.4	38.5	32	116.6	62.0	82	160.7	85.4	32	204.9	108.9	82	249.0	132.4
33	29.1	15.5	83	73.3	39.0	33	117.4	62.4	83	161.6	85.9	33	205.7	109.4	83	249.9	132.9
34	30.0	16.0	84	74.2	39.4	34	118.3	62.9	84	162.5	86.4	34	206.6	109.9	84	250.8	133.3
35	30.9	16.4	85	75.1	39.9	35	119.2	63.4	85	163.4	86.9	35	207.5	110.3	85	251.7	133.8
36	31.8	16.9	86	75.9	40.4	36	120.1	63.9	86	164.2	87.3	36	208.4	110.8	86	252.5	134.3
37	32.7	17.4	87	76.8	40.8	37	121.0	64.3	87	165.1	87.8	37	209.3	111.3	87	253.4	134.7
38	33.6	17.8	88	77.7	41.3	38	121.9	64.8	88	166.0	88.3	38	210.2	111.7	88	254.3	135.2
39	34.4	18.3	89	78.6	41.8	39	122.7	65.3	89	166.9	88.7	39	211.0	112.2	89	255.2	135.7
40	35.3	18.8	90	79.5	42.3	40	123.6	65.7	90	167.8	89.2	40	211.9	112.7	90	256.1	136.2
41	36.2	19.2	91	80.4	42.7	41	124.5	66.2	91	168.7	89.7	41	212.8	113.1	91	257.0	136.6
42	37.1	19.7	92	81.2	43.2	42	125.4	66.7	92	169.5	90.1	42	213.7	113.6	92	257.8	137.1
43	38.0	20.2	93	82.1	43.7	43	126.3	67.1	93	170.4	90.6	43	214.6	114.1	93	258.7	137.6
44	38.9	20.7	94	83.0	44.1	44	127.2	67.6	94	171.3	91.1	44	215.5	114.6	94	259.6	138.0
45	39.7	21.1	95	83.9	44.6	45	128.0	68.1	95	172.2	91.6	45	216.3	115.0	95	260.5	138.5
46	40.6	21.6	96	84.8	45.1	46	128.9	68.5	96	173.1	92.0	46	217.2	115.5	96	261.4	139.0
47	41.5	22.1	97	85.7	45.5	47	129.8	69.0	97	174.0	92.5	47	218.1	115.9	97	262.3	139.4
48	42.4	22.5	98	86.5	46.0	48	130.7	69.5	98	174.8	93.0	48	219.0	116.4	98	263.2	139.9
49	43.3	23.0	99	87.4	46.5	49	131.6	70.0	99	175.7	93.4	49	219.9	116.9	99	264.0	140.4
50	44.2	23.5	100	88.3	47.0	50	132.5	70.4	100	176.6	93.9	50	220.8	117.4	100	264.9	140.9
Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat	Diff	Dep	Lat

for 62 Deg.



# Difference of Latitude and Departure for 29 Deg.

29

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	44.6	24.7	101	88.3	49.0	151	132.1	73.2	201	175.8	97.4	251	219.5	121.7
2	01.7	01.0	52	45.5	25.2	02	89.2	49.4	52	132.9	73.7	02	176.7	97.9	52	220.4	122.2
3	02.6	01.5	53	46.4	25.7	03	89.1	49.9	53	133.8	74.2	03	177.5	98.4	53	221.3	122.7
4	03.5	01.9	54	47.2	26.2	04	91.0	50.4	54	134.7	74.7	04	178.4	98.9	54	222.2	123.1
5	04.4	02.4	55	48.1	26.7	05	91.8	50.9	55	135.6	75.1	05	179.3	99.4	55	223.0	123.6
6	05.2	02.9	56	49.0	27.1	106	92.7	51.4	156	136.4	75.6	206	180.2	99.9	256	223.9	124.1
7	06.1	03.4	57	49.9	27.6	07	93.6	51.9	57	137.3	76.1	07	181.0	100.4	57	224.8	124.6
8	07.0	03.9	58	50.7	28.1	08	94.5	52.4	58	138.2	76.6	08	181.9	100.8	58	225.6	125.1
9	07.9	04.4	59	51.6	28.6	09	95.3	52.8	59	139.1	77.1	09	182.8	101.3	59	226.5	125.6
10	08.7	04.8	60	52.5	29.1	10	96.2	53.3	60	139.9	77.6	10	183.7	101.8	260	227.4	126.0
11	09.6	05.3	61	53.4	29.6	111	97.1	53.8	161	140.8	78.1	211	184.5	102.3	261	228.3	126.5
12	10.5	05.8	62	54.2	30.1	12	98.0	54.3	62	141.7	78.5	12	185.4	102.8	62	229.1	127.0
13	11.4	06.3	63	55.1	30.5	13	98.8	54.8	63	142.6	79.0	13	186.3	103.3	63	230.0	127.5
14	12.2	06.8	64	56.0	31.0	14	99.7	55.3	64	143.4	79.5	14	187.2	103.7	64	230.9	128.0
15	13.1	07.3	65	56.8	31.5	15	100.6	55.8	65	144.3	80.0	15	188.0	104.2	65	231.8	128.5
16	14.0	07.8	66	57.7	32.0	116	101.5	56.2	166	145.2	80.5	216	188.9	104.7	266	232.6	129.0
17	14.9	08.2	67	58.6	32.5	17	102.3	56.7	67	146.1	81.0	17	189.8	105.2	67	233.5	129.4
18	15.7	08.7	68	59.5	33.0	18	103.2	57.2	68	146.9	81.4	18	190.7	105.7	68	234.4	129.9
19	16.6	09.2	69	60.3	33.5	19	104.1	57.7	69	147.8	81.9	19	191.5	106.2	69	235.3	130.4
20	17.5	09.7	70	61.2	33.9	20	105.0	58.2	70	148.7	82.4	20	192.4	106.7	70	236.1	130.9
21	18.4	10.2	71	62.1	34.4	121	105.8	58.7	171	149.6	82.9	221	193.3	107.1	271	237.0	131.4
22	19.2	10.7	72	63.0	34.9	22	106.7	59.1	72	150.4	83.4	22	194.2	107.6	72	237.9	131.9
23	20.1	11.2	73	63.8	35.4	23	107.6	59.6	73	151.3	83.9	23	195.0	108.1	73	238.8	132.4
24	21.0	11.6	74	64.7	35.9	24	108.5	60.1	74	152.2	84.4	24	195.9	108.6	74	239.6	132.8
25	21.9	12.1	75	65.6	36.4	25	109.3	60.6	75	153.1	84.8	25	196.8	109.1	75	240.5	133.3
26	22.7	12.6	76	66.5	36.8	126	110.2	61.1	176	153.9	85.3	226	197.7	109.6	276	241.4	133.8
27	23.6	13.1	77	67.3	37.3	27	111.1	61.6	77	154.8	85.8	27	198.5	110.0	77	242.3	134.3
28	24.5	13.6	78	68.2	37.8	28	111.9	62.1	78	155.7	86.3	28	199.4	110.5	78	243.1	134.8
29	25.4	14.1	79	69.1	38.3	29	112.8	62.5	79	156.6	86.8	29	200.3	111.0	79	244.0	135.3
30	26.2	14.6	80	70.0	38.8	30	113.7	63.0	80	157.4	87.3	30	201.2	111.5	80	244.9	135.7
31	27.1	15.0	81	70.8	39.3	131	114.6	63.5	181	158.3	87.7	231	202.0	112.0	281	245.8	136.2
32	28.0	15.5	82	71.7	39.8	32	115.4	64.0	82	159.2	88.2	32	202.9	112.5	82	246.6	136.7
33	28.9	16.0	83	72.6	40.2	33	116.3	64.5	83	160.1	88.7	33	203.8	113.0	83	247.5	137.2
34	29.7	16.5	84	73.5	40.7	34	117.2	65.0	84	160.9	89.2	34	204.7	113.4	84	248.4	137.7
35	30.6	17.0	85	74.3	41.2	35	118.1	65.4	85	161.8	89.7	35	205.5	113.9	85	249.3	138.2
36	31.5	17.5	86	75.2	41.7	136	118.9	65.9	186	162.7	90.2	236	206.4	114.4	286	250.1	138.7
37	32.4	17.9	87	76.1	42.2	37	119.8	66.4	87	163.6	90.7	37	207.3	114.9	87	251.0	139.1
38	33.2	18.4	88	77.0	42.7	38	120.7	66.9	88	164.4	91.1	38	208.2	115.4	88	251.9	139.6
39	34.1	18.9	89	77.8	43.1	39	121.6	67.4	89	165.3	91.6	39	209.0	115.9	89	252.8	140.1
40	35.0	19.4	90	78.7	43.6	40	122.4	67.9	90	166.2	92.1	40	209.9	116.4	90	253.6	140.6
41	35.9	19.9	91	79.6	44.1	141	123.3	68.4	191	167.0	92.6	241	210.8	116.8	291	254.5	141.1
42	36.7	20.4	92	80.5	44.6	42	124.2	68.8	92	167.9	93.1	42	211.7	117.3	92	255.4	141.6
43	37.6	20.8	93	81.3	45.1	43	125.1	69.3	93	168.8	93.6	43	212.5	117.8	93	256.3	142.0
44	38.5	21.3	94	82.2	45.6	44	125.9	69.8	94	169.7	94.1	44	213.4	118.3	94	257.1	142.5
45	39.4	21.8	95	83.1	46.1	45	126.8	70.3	95	170.5	94.5	45	214.3	118.8	95	258.0	143.0
46	40.2	22.3	96	84.0	46.5	146	127.7	70.8	196	171.4	95.0	246	215.2	119.3	296	258.9	143.5
47	41.1	22.8	97	84.8	47.0	47	128.6	71.3	97	172.3	95.5	47	216.0	119.7	97	259.8	144.0
48	42.0	23.3	98	85.7	47.5	48	129.4	71.8	98	173.2	96.0	48	216.9	120.2	98	260.6	144.5
49	42.9	23.8	99	86.6	48.0	49	130.3	72.2	99	174.0	96.5	49	217.8	120.7	99	261.5	145.0
50	43.7	24.2	100	87.5	48.5	150	131.2	72.7	200	174.9	97.0	250	218.7	121.2	300	262.4	145.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

K

for 61 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	44.2	25.5	101	87.5	50.5	151	130.8	75.5	201	174.1	100.5	251	217.4	125.5
2	01.7	01.0	52	45.0	26.0	02	88.3	51.0	52	131.6	76.0	02	174.9	101.0	52	218.2	126.0
3	02.6	01.5	53	45.9	26.5	03	89.2	51.5	53	132.5	76.5	03	175.8	101.5	53	219.1	126.5
4	03.5	02.0	54	46.8	27.0	04	90.1	52.0	54	133.4	77.0	04	176.7	102.0	54	220.0	127.0
5	04.3	02.5	55	47.6	27.5	05	90.9	52.5	55	134.2	77.5	05	177.5	102.5	55	220.8	127.5
6	05.2	03.0	56	48.5	28.0	06	91.8	53.0	56	135.1	78.0	06	178.4	103.0	56	221.7	128.0
7	06.1	03.5	57	49.4	28.5	07	92.7	53.5	57	136.0	78.5	07	179.3	103.5	57	222.6	128.5
8	06.9	04.0	58	50.2	29.0	08	93.5	54.0	58	136.8	79.0	08	180.1	104.0	58	223.4	129.0
9	07.8	04.5	59	51.1	29.5	09	94.4	54.5	59	137.7	79.5	09	181.0	104.5	59	224.3	129.5
10	08.7	05.0	60	52.0	30.0	10	95.3	55.0	60	138.6	80.0	10	181.9	105.0	60	225.2	130.0
11	09.5	05.5	61	52.8	30.5	11	96.1	55.5	61	139.4	80.5	11	182.7	105.5	61	226.0	130.5
12	10.4	06.0	62	53.7	31.0	12	97.0	56.0	62	140.3	81.0	12	183.6	106.0	62	226.9	131.0
13	11.3	06.5	63	54.6	31.5	13	97.9	56.5	63	141.2	81.5	13	184.5	106.5	63	227.8	131.5
14	12.1	07.0	64	55.4	32.0	14	98.7	57.0	64	142.0	82.0	14	185.3	107.0	64	228.6	132.0
15	13.0	07.5	65	56.3	32.5	15	99.6	57.5	65	142.9	82.5	15	186.2	107.5	65	229.5	132.5
16	13.9	08.0	66	57.2	33.0	16	100.5	58.0	66	143.8	83.0	16	187.1	108.0	66	230.4	133.0
17	14.7	08.5	67	58.0	33.5	17	101.3	58.5	67	144.6	83.5	17	187.9	108.5	67	231.2	133.5
18	15.6	09.0	68	58.9	34.0	18	102.2	59.0	68	145.5	84.0	18	188.8	109.0	68	232.1	134.0
19	16.5	09.5	69	59.8	34.5	19	103.1	59.5	69	146.4	84.5	19	189.7	109.5	69	233.0	134.5
20	17.3	10.0	70	60.6	35.0	20	103.9	60.0	70	147.2	85.0	20	190.5	110.0	70	233.8	135.0
21	18.2	10.5	71	61.5	35.5	21	104.8	60.5	71	148.1	85.5	21	191.4	110.5	71	234.7	135.5
22	19.1	11.0	72	62.4	36.0	22	105.7	61.0	72	149.0	86.0	22	192.3	111.0	72	235.6	136.0
23	19.9	11.5	73	63.2	36.5	23	106.6	61.5	73	149.8	86.5	23	193.1	111.5	73	236.4	136.5
24	20.8	12.0	74	64.1	37.0	24	107.4	62.0	74	150.7	87.0	24	194.0	112.0	74	237.3	137.0
25	21.7	12.5	75	65.0	37.5	25	108.3	62.5	75	151.6	87.5	25	194.9	112.5	75	238.2	137.5
26	22.5	13.0	76	65.8	38.0	26	109.1	63.0	76	152.4	88.0	26	195.7	113.0	76	239.0	138.0
27	23.4	13.5	77	66.7	38.5	27	110.0	63.5	77	153.3	88.5	27	196.6	113.5	77	239.9	138.5
28	24.2	14.0	78	67.5	39.0	28	110.8	64.0	78	154.1	89.0	28	197.4	114.0	78	240.7	139.0
29	25.1	14.5	79	68.4	39.5	29	111.7	64.5	79	155.0	89.5	29	198.3	114.5	79	241.6	139.5
30	26.0	15.0	80	69.3	40.0	30	112.6	65.0	80	155.9	90.0	30	199.2	115.0	80	242.5	140.0
31	26.8	15.5	81	70.1	40.5	31	113.4	65.5	81	156.7	90.5	31	200.0	115.5	81	243.3	140.5
32	27.7	16.0	82	71.0	41.0	32	114.3	66.0	82	157.6	91.0	32	200.9	116.0	82	244.2	141.0
33	28.6	16.5	83	71.9	41.5	33	115.2	66.5	83	158.5	91.5	33	201.8	116.5	83	245.1	141.5
34	29.4	17.0	84	72.7	42.0	34	116.0	67.0	84	159.3	92.0	34	202.6	117.0	84	245.9	142.0
35	30.3	17.5	85	73.6	42.5	35	116.9	67.5	85	160.2	92.5	35	203.5	117.5	85	246.8	142.5
36	31.2	18.0	86	74.5	43.0	36	117.8	68.0	86	161.1	93.0	36	204.4	118.0	86	247.7	143.0
37	32.0	18.5	87	75.3	43.5	37	118.6	68.5	87	161.9	93.5	37	205.2	118.5	87	248.5	143.5
38	32.9	19.0	88	76.2	44.0	38	119.5	69.0	88	162.8	94.0	38	206.1	119.0	88	249.4	144.0
39	33.8	19.5	89	77.1	44.5	39	120.4	69.5	89	163.7	94.5	39	207.0	119.5	89	250.3	144.5
40	34.6	20.0	90	77.9	45.0	40	121.2	70.0	90	164.5	95.0	40	207.8	120.0	90	251.1	145.0
41	35.5	20.5	91	78.8	45.5	41	122.1	70.5	91	165.4	95.5	41	208.7	120.5	91	252.0	145.5
42	36.4	21.0	92	79.7	46.0	42	123.0	71.0	92	166.3	96.0	42	209.6	121.0	92	252.9	146.0
43	37.2	21.5	93	80.5	46.5	43	123.8	71.5	93	167.1	96.5	43	210.4	121.5	93	253.7	146.5
44	38.1	22.0	94	81.4	47.0	44	124.7	72.0	94	168.0	97.0	44	211.3	122.0	94	254.6	147.0
45	39.0	22.5	95	82.3	47.5	45	125.6	72.5	95	168.9	97.5	45	212.2	122.5	95	255.5	147.5
46	39.8	23.0	96	83.1	48.0	46	126.4	73.0	96	169.7	98.0	46	213.1	123.0	96	256.3	148.0
47	40.7	23.5	97	84.0	48.5	47	127.3	73.5	97	170.6	98.5	47	213.9	123.5	97	257.2	148.5
48	41.6	24.0	98	84.9	49.0	48	128.2	74.0	98	171.5	99.0	48	214.8	124.0	98	258.1	149.0
49	42.4	24.5	99	85.7	49.5	49	129.0	74.5	99	172.3	99.5	49	215.6	124.5	99	258.9	149.5
50	43.3	25.0	100	86.6	50.0	50	129.9	75.0	100	173.2	100.0	50	216.5	125.0	100	259.8	150.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 60 Deg.



# Difference of Latitude and Departure for 31 Deg.

31

Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep	Dist.	Lat	Dep
1	00.9	00.5	51	43.7	26.3	101	86.6	52.0	151	129.4	77.8	201	172.3	103.5	251	215.1	129.3
2	01.7	01.0	52	44.6	26.8	02	87.4	52.5	52	130.3	78.3	02	173.1	104.0	52	216.0	129.8
3	02.6	01.5	53	45.4	27.3	03	88.3	53.0	53	131.1	78.8	03	174.0	104.5	53	216.8	130.3
4	03.4	02.1	54	46.3	27.8	04	89.1	53.6	54	132.0	79.3	04	174.8	105.1	54	217.7	130.8
5	04.3	02.6	55	47.1	28.3	05	90.0	54.1	55	132.8	79.8	05	175.7	105.6	55	218.5	131.3
6	05.1	03.1	56	48.0	28.8	106	90.8	54.6	156	133.7	80.3	206	176.5	106.1	256	219.4	131.8
7	06.0	03.6	57	48.8	29.4	07	91.7	55.1	57	134.5	80.9	07	177.4	106.6	57	220.2	132.4
8	06.9	04.1	58	49.7	29.9	08	92.6	55.6	58	135.4	81.4	08	178.3	107.1	58	221.1	132.9
9	07.7	04.6	59	50.6	30.4	09	93.4	56.1	59	136.3	81.9	09	179.1	107.6	59	222.0	133.4
10	08.6	05.2	60	51.4	30.9	10	94.3	56.7	60	137.1	82.4	10	180.0	108.2	60	222.8	133.9
11	09.4	05.7	61	52.3	31.4	111	95.1	57.2	161	138.0	82.9	211	180.8	108.7	261	223.7	134.4
12	10.3	06.2	62	53.1	31.9	12	96.0	57.7	62	138.8	83.4	12	181.7	109.2	62	224.5	134.9
13	11.1	06.7	63	54.0	32.4	13	96.8	58.2	63	139.7	83.9	13	182.5	109.7	63	225.4	135.4
14	12.0	07.2	64	54.8	33.0	14	97.7	58.7	64	140.5	84.5	14	183.4	110.2	64	226.2	136.0
15	12.9	07.7	65	55.7	33.5	15	98.6	59.2	65	141.4	85.0	15	184.3	110.7	65	227.1	136.5
16	13.7	08.2	66	56.6	34.0	116	99.4	59.7	166	142.3	85.5	216	185.1	111.2	266	228.0	137.0
17	14.6	08.8	67	57.4	34.5	17	100.3	60.3	67	143.1	86.0	17	186.0	111.8	67	228.8	137.5
18	15.4	09.3	68	58.3	35.0	18	101.1	60.8	68	144.0	86.5	18	186.8	112.3	68	229.7	138.0
19	16.3	09.8	69	59.1	35.5	19	102.0	61.3	69	144.8	87.0	19	187.7	112.8	69	230.5	138.5
20	17.1	10.3	70	60.0	36.1	20	102.8	61.8	70	145.7	87.6	20	188.5	113.3	70	231.4	139.1
21	18.0	10.8	71	60.8	36.6	121	103.7	62.3	171	146.5	88.1	221	189.4	113.8	271	232.2	139.6
22	18.9	11.3	72	61.7	37.1	22	104.6	62.8	72	147.4	88.6	22	190.3	114.3	72	233.1	140.1
23	19.7	11.8	73	62.6	37.6	23	105.4	63.3	73	148.3	89.1	23	191.1	114.8	73	234.0	140.6
24	20.6	12.4	74	63.4	38.1	24	106.3	63.9	74	149.1	89.6	24	192.0	115.4	74	234.8	141.1
25	21.4	12.9	75	64.3	38.6	25	107.1	64.4	75	150.0	90.1	25	192.8	115.9	75	235.7	141.6
26	22.3	13.4	76	65.1	39.1	126	108.0	64.9	176	150.8	90.6	226	193.7	116.4	276	236.5	142.1
27	23.1	13.9	77	66.0	39.7	27	108.8	65.4	77	151.7	91.2	27	194.5	116.9	77	237.4	142.7
28	24.0	14.4	78	66.8	40.2	28	109.7	65.9	78	152.5	91.7	28	195.4	117.4	78	238.2	143.2
29	24.9	14.9	79	67.7	40.7	29	110.6	66.4	79	153.4	92.2	29	196.3	117.9	79	239.1	143.7
30	25.7	15.5	80	68.6	41.2	30	111.4	67.0	80	154.3	92.7	30	197.1	118.5	80	240.0	144.2
31	26.6	16.0	81	69.4	41.7	131	112.3	67.5	181	155.1	93.2	231	198.0	119.0	281	240.8	144.7
32	27.4	16.5	82	70.3	42.2	32	113.1	68.0	82	156.0	93.7	32	198.8	119.5	82	241.7	145.2
33	28.3	17.0	83	71.1	42.7	33	114.0	68.5	83	156.8	94.2	33	199.7	120.0	83	242.5	145.7
34	29.1	17.5	84	72.0	43.3	34	114.8	69.0	84	157.7	94.8	34	200.5	120.5	84	243.4	146.3
35	30.0	18.0	85	72.8	43.8	35	115.7	69.5	85	158.5	95.3	35	201.4	121.0	85	244.2	146.8
36	30.9	18.5	86	73.7	44.3	136	116.6	70.0	186	159.4	95.8	236	202.3	121.5	286	245.1	147.3
37	31.7	19.1	87	74.6	44.8	37	117.4	70.6	87	160.3	96.3	37	203.1	122.1	87	246.0	147.8
38	32.6	19.6	88	75.4	45.3	38	118.3	71.1	88	161.1	96.8	38	204.0	122.6	88	246.8	148.3
39	33.4	20.1	89	76.3	45.8	39	119.1	71.6	89	162.0	97.3	39	204.8	123.1	89	247.7	148.8
40	34.3	20.6	90	77.1	46.4	40	120.0	72.1	90	162.8	97.9	40	205.7	123.6	90	248.5	149.4
41	35.1	21.1	91	78.0	46.9	141	120.8	72.6	191	163.7	98.4	241	206.5	124.1	291	249.4	149.9
42	36.0	21.6	92	78.8	47.4	42	121.7	73.1	92	164.5	98.9	42	207.4	124.6	92	250.2	150.4
43	36.9	22.1	93	79.7	47.9	43	122.6	73.6	93	165.4	99.4	43	208.3	125.1	93	251.1	150.9
44	37.7	22.6	94	80.6	48.4	44	123.4	74.2	94	166.3	99.9	44	209.1	125.9	94	252.0	151.4
45	38.6	23.2	95	81.4	48.9	45	124.3	74.7	95	167.1	100.4	45	210.0	126.2	95	252.8	151.9
46	39.4	23.7	96	82.3	49.4	146	125.1	75.2	196	168.0	100.9	246	210.8	126.7	296	253.7	152.4
47	40.3	24.2	97	83.1	50.0	47	126.0	75.7	97	168.8	101.5	47	211.7	127.2	97	254.5	153.0
48	41.1	24.7	98	84.0	50.5	48	126.8	76.2	98	169.7	102.0	48	212.5	127.7	98	255.4	153.5
49	42.0	25.2	99	84.8	51.0	49	127.7	76.7	99	170.5	102.5	49	213.4	128.2	99	256.2	154.0
50	42.9	25.8	100	85.7	51.5	150	128.6	77.3	200	171.4	103.0	250	214.3	128.8	300	257.1	154.5
Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat	Dist.	Dep	Lat

for 59 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.5	51	43.2	27.0	101	85.6	53.5	151	128.0	80.0	201	170.4	106.5	251	212.8	133.0
2	01.7	01.1	52	44.1	27.6	02	86.5	54.1	52	128.9	80.6	02	171.3	107.1	52	213.7	133.6
3	02.5	01.6	53	44.9	28.1	03	87.3	54.6	53	129.7	81.1	03	172.1	107.6	53	214.5	134.1
4	03.4	02.1	54	45.8	28.6	04	88.2	55.1	54	130.6	81.6	04	173.0	108.1	54	215.4	134.6
5	04.2	02.7	55	46.6	29.2	05	89.0	55.7	55	131.4	82.2	05	173.8	108.7	55	216.2	135.2
6	05.1	03.2	56	47.5	29.7	106	89.9	56.2	156	132.3	82.7	206	174.7	109.2	256	217.1	135.7
7	05.9	03.7	57	48.3	30.2	07	90.7	56.7	57	133.1	83.2	07	175.5	109.7	57	217.9	136.2
8	06.8	04.2	58	49.2	30.7	08	91.6	57.2	58	134.0	83.7	08	176.4	110.2	58	218.8	136.7
9	07.6	04.8	59	50.0	31.3	09	92.4	57.8	59	134.8	84.3	09	177.2	110.8	59	219.6	137.3
10	08.5	05.3	60	50.9	31.8	10	93.3	58.3	60	135.7	84.8	10	178.1	111.3	60	220.5	137.8
11	09.3	05.8	61	51.7	32.3	111	94.1	58.8	161	136.5	85.3	211	178.9	111.8	261	221.3	138.3
12	10.2	06.4	62	52.6	32.9	12	95.0	59.4	62	137.4	85.9	12	179.8	112.4	62	222.2	138.9
13	11.0	06.9	63	53.4	33.4	13	95.8	59.9	63	138.2	86.4	13	180.6	112.9	63	223.0	139.4
14	11.9	07.4	64	54.3	33.9	14	96.7	60.4	64	139.1	86.9	14	181.5	113.4	64	223.9	139.9
15	12.7	08.0	65	55.1	34.5	15	97.5	61.0	65	139.9	87.5	15	182.3	114.0	65	224.7	140.5
16	13.6	08.5	66	56.0	35.0	116	98.4	61.5	166	140.8	88.0	216	183.2	114.5	266	225.6	141.0
17	14.4	09.0	67	56.8	35.5	17	99.2	62.0	67	141.6	88.5	17	184.0	115.0	67	226.4	141.5
18	15.3	09.5	68	57.7	36.0	18	100.1	62.5	68	142.5	89.0	18	184.9	115.5	68	227.3	142.0
19	16.1	10.1	69	58.5	36.6	19	100.9	63.1	69	143.3	89.6	19	185.7	116.1	69	228.1	142.6
20	17.0	10.6	70	59.4	37.1	20	101.8	63.6	70	144.2	90.1	20	186.6	116.6	70	229.0	143.1
21	17.8	11.1	71	60.2	37.9	121	102.6	64.1	171	145.0	90.6	221	187.4	117.1	271	229.8	143.6
22	18.7	11.7	72	61.1	38.2	22	103.5	64.7	72	145.9	91.2	22	188.3	117.7	72	230.7	144.2
23	19.5	12.2	73	61.9	38.7	23	104.3	65.2	73	146.7	91.7	23	189.1	118.2	73	231.5	144.7
24	20.4	12.7	74	62.8	39.2	24	105.2	65.7	74	147.6	92.2	24	190.0	118.7	74	232.4	145.2
25	21.2	13.3	75	63.6	39.8	25	106.0	66.3	75	148.4	92.8	25	190.8	119.3	75	233.2	145.8
26	22.0	13.8	76	64.4	40.3	126	106.8	66.8	176	149.2	93.3	226	191.6	119.8	276	234.0	146.3
27	22.9	14.3	77	65.3	40.8	27	107.7	67.3	77	150.1	93.8	27	192.5	120.3	77	234.9	146.8
28	23.7	14.8	78	66.1	41.3	28	108.5	67.8	78	150.9	94.3	28	193.3	120.8	78	235.7	147.3
29	24.6	15.4	79	67.0	41.9	29	109.4	68.4	79	151.8	94.9	29	194.2	121.4	79	236.6	147.9
30	25.4	15.9	80	67.8	42.4	30	110.2	68.9	80	152.6	95.4	30	195.0	121.9	80	237.4	148.4
31	26.3	16.4	81	68.7	42.9	131	111.1	69.4	181	153.5	95.9	231	195.9	122.4	281	238.3	148.9
32	27.1	17.0	82	69.5	43.5	32	111.9	70.0	82	154.3	96.5	32	196.7	123.0	82	239.1	149.5
33	28.0	17.5	83	70.4	44.0	33	112.8	70.5	83	155.2	97.0	33	197.6	123.5	83	240.0	150.0
34	28.8	18.0	84	71.2	44.5	34	113.6	71.0	84	156.0	97.5	34	198.4	124.0	84	240.8	150.5
35	29.7	18.6	85	72.1	45.1	35	114.5	71.6	85	156.9	98.1	35	199.3	124.6	85	241.7	151.1
36	30.5	19.1	86	72.9	45.6	136	115.3	72.1	186	157.7	98.6	236	200.1	125.1	286	242.5	151.6
37	31.4	19.6	87	73.8	46.1	37	116.2	72.6	87	158.6	99.1	37	201.0	125.6	87	243.4	152.1
38	32.2	20.1	88	74.6	46.6	38	117.0	73.1	88	159.4	99.6	38	201.8	126.1	88	244.2	152.6
39	33.1	20.7	89	75.5	47.2	39	117.9	73.7	89	160.3	100.2	39	202.7	126.7	89	245.1	153.2
40	33.9	21.2	90	76.3	47.7	40	118.7	74.2	90	161.1	100.7	40	203.5	127.2	90	245.9	153.7
41	34.8	21.7	91	77.2	48.2	141	119.6	74.7	191	162.0	101.2	241	204.4	127.7	291	246.8	154.2
42	35.6	22.3	92	78.0	48.8	42	120.4	75.3	92	162.8	101.8	42	205.2	128.3	92	247.6	154.8
43	36.5	22.8	93	78.9	49.3	43	121.3	75.8	93	163.7	102.3	43	206.1	128.8	93	248.5	155.3
44	37.3	23.3	94	79.7	49.8	44	122.1	76.3	94	164.5	102.8	44	206.9	129.3	94	249.3	155.8
45	38.2	23.9	95	80.6	50.4	45	123.0	76.9	95	165.4	103.4	45	207.8	129.9	95	250.2	156.4
46	39.0	24.4	96	81.4	50.9	146	123.8	77.4	196	166.2	103.9	246	208.6	130.4	296	251.0	156.9
47	39.9	24.9	97	82.3	51.4	47	124.7	77.9	97	167.1	104.4	47	209.5	130.9	97	251.9	157.4
48	40.7	25.4	98	83.1	51.9	48	125.5	78.4	98	167.9	104.9	48	210.3	131.4	98	252.7	157.9
49	41.6	26.0	99	84.0	52.5	49	126.4	79.0	99	168.8	105.5	49	211.1	132.0	99	253.6	158.5
50	42.4	26.5	100	84.8	53.0	150	127.2	79.5	200	169.6	106.0	250	212.0	132.5	300	254.4	159.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 58 Deg.



# Difference of Latitude and Departure for 33 Deg. 33

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.5	51	42.8	27.8	101	84.7	55.0	151	126.6	82.2	201	168.6	109.5	251	210.5	136.7
2	01.7	01.1	52	43.6	28.3	02	85.5	55.5	52	127.5	82.8	02	169.4	110.0	52	211.3	137.2
3	02.5	01.6	53	44.4	28.9	03	86.4	56.1	53	128.3	83.3	03	170.2	110.6	53	212.2	137.8
4	03.4	02.2	54	45.3	29.4	04	87.2	56.6	54	129.1	83.9	04	171.1	111.1	54	213.0	138.3
5	04.2	02.7	55	46.1	30.0	05	88.1	57.2	55	130.0	84.4	05	171.9	111.6	55	213.8	138.9
6	05.0	03.3	56	47.0	30.5	106	88.9	57.7	156	130.8	85.0	206	172.8	112.2	256	214.7	139.4
7	05.9	03.8	57	47.8	31.0	07	89.7	58.3	57	131.7	85.5	07	173.6	112.7	57	215.5	140.0
8	06.7	04.4	58	48.6	31.6	08	90.6	58.8	58	132.5	86.0	08	174.4	113.3	58	216.4	140.5
9	07.5	04.9	59	49.5	32.1	09	91.4	59.4	59	133.3	86.6	09	175.3	113.8	59	217.2	141.1
10	08.4	05.4	60	50.3	32.7	10	92.2	59.9	60	134.2	87.1	10	176.1	114.4	60	218.0	141.6
11	09.2	06.0	61	51.2	33.2	111	93.1	60.5	161	135.0	87.7	211	176.9	114.9	261	218.9	142.1
12	10.1	06.5	62	52.0	33.8	12	93.9	61.0	62	135.9	88.2	12	177.8	115.5	62	219.7	142.7
13	10.9	07.1	63	52.8	34.3	13	94.8	61.5	63	136.7	88.8	13	178.6	116.0	63	220.6	143.2
14	11.7	07.6	64	53.7	34.9	14	95.6	62.1	64	137.5	89.3	14	179.5	116.5	64	221.4	143.8
15	12.6	08.2	65	54.5	35.4	15	96.4	62.6	65	138.4	89.9	15	180.3	117.1	65	222.2	144.3
16	13.4	08.7	66	55.3	35.9	116	97.3	63.2	166	139.2	90.4	216	181.1	117.6	266	223.1	144.9
17	14.3	09.3	67	56.2	36.5	17	98.1	63.7	67	140.0	90.9	17	182.0	118.2	67	223.9	145.4
18	15.1	09.8	68	57.0	37.0	18	99.0	64.3	68	140.9	91.5	18	182.8	118.7	68	224.7	146.0
19	15.9	10.3	69	57.9	37.6	19	99.8	64.8	69	141.7	92.0	19	183.7	119.3	69	225.6	146.5
20	16.8	10.9	70	58.7	38.1	20	100.6	65.4	70	142.6	92.6	20	184.5	119.8	70	226.4	147.0
21	17.6	11.4	71	59.5	38.7	121	101.5	65.9	171	143.4	93.1	221	185.3	120.4	271	227.3	147.6
22	18.4	12.0	72	60.4	39.2	22	102.3	66.4	72	144.2	93.7	22	186.2	120.9	72	228.1	148.1
23	19.3	12.5	73	61.2	39.8	23	103.1	67.0	73	145.1	94.2	23	187.0	121.4	73	228.9	148.7
24	20.1	13.1	74	62.1	40.3	24	104.0	67.5	74	145.9	94.8	24	187.8	122.0	74	229.8	149.2
25	21.0	13.6	75	62.9	40.8	25	104.8	68.1	75	146.8	95.3	25	188.7	122.5	75	230.6	149.8
26	21.8	14.2	76	63.7	41.4	126	105.7	68.6	176	147.6	95.8	226	189.5	123.1	276	231.5	150.3
27	22.6	14.7	77	64.6	41.9	27	106.5	69.2	77	148.4	96.4	27	190.4	123.6	77	232.3	150.9
28	23.5	15.2	78	65.4	42.5	28	107.3	69.7	78	149.3	96.9	28	191.2	124.2	78	233.1	151.4
29	24.3	15.8	79	66.2	43.0	29	108.2	70.3	79	150.1	97.5	29	192.0	124.7	79	234.0	151.9
30	25.2	16.3	80	67.1	43.6	30	109.0	70.8	80	150.9	98.0	30	192.9	125.3	80	234.8	152.5
31	26.0	16.9	81	67.9	44.1	131	109.9	71.3	181	151.8	98.6	231	193.7	125.8	281	235.6	153.0
32	26.8	17.4	82	68.8	44.7	32	110.7	71.9	82	152.6	99.1	32	194.6	126.3	82	236.5	153.1
33	27.7	18.0	83	69.6	45.2	33	111.5	72.4	83	153.5	99.7	33	195.4	126.9	83	237.3	154.2
34	28.5	18.5	84	70.4	45.7	34	112.4	73.0	84	154.3	100.2	34	196.2	127.4	84	238.2	154.7
35	29.4	19.1	85	71.3	46.3	35	113.2	73.5	85	155.1	100.8	35	197.1	128.0	85	239.0	155.2
36	30.2	19.6	86	72.1	46.8	136	114.0	74.1	186	156.0	101.3	236	197.9	128.5	286	239.8	155.8
37	31.0	20.2	87	73.0	47.4	37	114.9	74.6	87	156.8	101.8	37	198.7	129.1	87	240.7	156.3
38	31.9	20.7	88	73.8	47.9	38	115.7	75.2	88	157.7	102.4	38	199.6	129.6	88	241.5	156.8
39	32.7	21.2	89	74.6	48.5	39	116.6	75.7	89	158.5	102.9	39	200.4	130.2	89	242.4	157.4
40	33.5	21.8	90	75.5	49.0	40	117.4	76.2	90	159.3	103.5	40	201.3	130.7	90	243.2	157.9
41	34.4	22.3	91	76.3	49.6	141	118.2	76.8	191	160.2	104.0	241	202.1	131.2	291	244.0	158.5
42	35.2	22.9	92	77.2	50.1	42	119.1	77.3	92	161.0	104.6	42	202.9	131.8	92	244.9	159.0
43	36.1	23.4	93	78.0	50.6	43	119.9	77.9	93	161.8	105.1	43	203.8	132.3	93	245.7	159.6
44	36.9	24.0	94	78.8	51.2	44	120.8	78.4	94	162.7	105.7	44	204.6	132.9	94	246.5	160.1
45	37.7	24.5	95	79.7	51.7	45	121.6	79.0	95	163.5	106.2	45	205.5	133.4	95	247.4	160.7
46	38.6	25.1	96	80.5	52.3	146	122.4	79.5	196	164.4	106.7	246	206.3	134.0	296	248.2	161.2
47	39.4	25.6	97	81.3	52.8	47	123.3	80.1	97	165.2	107.3	47	207.1	134.5	97	249.1	161.7
48	40.3	26.1	98	82.2	53.4	48	124.1	80.6	98	166.0	107.8	48	208.0	135.1	98	249.9	162.3
49	41.1	26.7	99	83.0	53.9	49	125.0	81.1	99	166.9	108.4	49	208.8	135.6	99	250.7	162.8
50	41.9	27.2	100	83.9	54.5	150	125.8	81.7	200	167.7	108.9	250	209.7	136.2	300	251.6	163.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

L

for 57 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	42.3	28.5	101	83.7	56.5	151	125.2	84.4	201	166.6	112.4	251	208.1	140.4
2	01.7	01.1	52	43.1	29.1	02	84.6	57.0	52	126.0	85.0	02	167.5	113.0	52	208.9	140.9
3	02.5	01.7	53	43.9	29.6	03	85.4	57.6	53	126.8	85.6	03	168.3	113.5	53	209.7	141.5
4	03.3	02.2	54	44.8	30.2	04	86.2	58.2	54	127.7	86.1	04	169.1	114.1	54	210.6	142.0
5	04.1	02.8	55	45.6	30.8	05	87.0	58.7	55	128.5	86.7	05	169.9	114.6	55	211.4	142.6
6	05.0	03.4	56	46.4	31.3	06	87.9	59.3	56	129.3	87.2	06	170.8	115.2	56	212.2	143.2
7	05.8	03.9	57	47.3	31.9	07	88.7	59.8	57	130.2	87.8	07	171.6	115.8	57	213.1	143.7
8	06.6	04.5	58	48.1	32.4	08	89.5	60.4	58	131.0	88.4	08	172.4	116.3	58	213.9	144.4
9	07.5	05.0	59	48.9	33.0	09	90.4	61.0	59	131.8	88.9	09	173.3	116.9	59	214.7	144.8
10	08.3	05.6	60	49.7	33.6	10	91.2	61.5	60	132.6	89.5	10	174.1	117.4	60	215.5	145.4
11	09.1	06.2	61	50.6	34.1	11	92.0	62.1	61	133.5	90.0	11	174.9	118.0	61	216.4	146.0
12	09.9	06.7	62	51.4	34.7	12	92.8	62.6	62	134.3	90.6	12	175.7	118.6	62	217.2	146.5
13	10.8	07.3	63	52.2	35.2	13	93.7	63.2	63	135.1	91.1	13	176.6	119.1	63	218.0	147.1
14	11.6	07.8	64	53.1	35.8	14	94.5	63.7	64	136.0	91.7	14	177.4	119.7	64	218.9	147.6
15	12.4	08.4	65	53.9	36.3	15	95.3	64.3	65	136.8	92.3	15	178.2	120.2	65	219.7	148.2
16	13.3	08.9	66	54.7	36.9	16	96.2	64.9	66	137.6	92.8	16	179.1	120.8	66	220.5	148.7
17	14.1	09.5	67	55.5	37.5	17	97.0	65.4	67	138.4	93.4	17	179.9	121.3	67	221.3	149.3
18	14.9	10.1	68	56.4	38.0	18	97.8	66.0	68	139.3	93.9	18	180.7	121.9	68	222.2	149.9
19	15.8	10.6	69	57.2	38.6	19	98.7	66.5	69	140.1	94.5	19	181.6	122.5	69	223.0	150.4
20	16.6	11.2	70	58.0	39.1	20	99.5	67.1	70	140.9	95.1	20	182.4	123.0	70	223.8	151.0
21	17.4	11.7	71	58.9	39.7	21	100.3	67.7	71	141.8	95.6	21	183.2	123.6	71	224.7	151.5
22	18.2	12.3	72	59.7	40.3	22	101.1	68.2	72	142.6	96.2	22	184.0	124.1	72	225.5	152.1
23	19.1	12.9	73	60.5	40.8	23	102.0	68.8	73	143.4	96.7	23	184.9	124.7	73	226.3	152.7
24	19.9	13.4	74	61.3	41.4	24	102.8	69.3	74	144.2	97.3	24	185.7	125.3	74	227.1	153.2
25	20.7	14.0	75	62.2	41.9	25	103.6	69.9	75	145.1	97.9	25	186.5	125.8	75	228.0	153.8
26	21.6	14.5	76	63.0	42.5	26	104.5	70.5	76	145.9	98.4	26	187.4	126.4	76	228.8	154.3
27	22.4	15.1	77	63.8	43.1	27	105.3	71.0	77	146.7	99.0	27	188.2	126.9	77	229.6	154.9
28	23.2	15.7	78	64.7	43.6	28	106.1	71.6	78	147.6	99.5	28	189.0	127.5	78	230.5	155.5
29	24.0	16.2	79	65.5	44.2	29	106.9	72.1	79	148.4	100.1	29	189.8	128.1	79	231.3	156.0
30	24.9	16.8	80	66.3	44.7	30	107.8	72.7	80	149.2	100.7	30	190.7	128.6	80	232.1	156.6
31	25.7	17.3	81	67.1	45.3	31	108.6	73.3	81	150.0	101.2	31	191.5	129.2	81	232.9	157.1
32	26.5	17.9	82	68.0	45.9	32	109.4	73.8	82	150.9	101.8	32	192.3	129.7	82	233.8	157.7
33	27.4	18.5	83	68.8	46.4	33	110.3	74.4	83	151.7	102.3	33	193.2	130.3	83	234.6	158.3
34	28.2	19.0	84	69.6	47.0	34	111.1	74.9	84	152.5	102.9	34	194.0	130.9	84	235.4	158.8
35	29.0	19.6	85	70.5	47.5	35	111.9	75.5	85	153.4	103.5	35	194.8	131.4	85	236.3	159.4
36	29.8	20.1	86	71.3	48.1	36	112.7	76.1	86	154.2	104.0	36	195.6	132.0	86	237.1	159.9
37	30.7	20.7	87	72.1	48.7	37	113.6	76.6	87	155.0	104.6	37	196.5	132.5	87	237.9	160.5
38	31.5	21.2	88	73.0	49.2	38	114.4	77.2	88	155.9	105.1	38	197.3	133.1	88	238.8	161.0
39	32.3	21.8	89	73.8	49.8	39	115.2	77.7	89	156.7	105.7	39	198.1	133.6	89	239.6	161.6
40	33.2	22.4	90	74.6	50.3	40	116.1	78.3	90	157.5	106.2	40	199.0	134.2	90	240.4	162.2
41	34.0	22.9	91	75.4	50.9	41	116.9	78.8	91	158.3	106.8	41	199.8	134.8	91	241.2	162.7
42	34.8	23.5	92	76.3	51.4	42	117.7	79.4	92	159.2	107.4	42	200.6	135.3	92	242.1	163.3
43	35.6	24.0	93	77.1	52.0	43	118.5	80.0	93	160.0	107.9	43	201.4	135.9	93	242.9	163.8
44	36.5	24.6	94	77.9	52.6	44	119.4	80.5	94	160.8	108.5	44	202.3	136.4	94	243.7	164.4
45	37.3	25.2	95	78.8	53.1	45	120.2	81.1	95	161.7	109.0	45	203.1	137.0	95	244.6	165.0
46	38.1	25.7	96	79.6	53.7	46	121.0	81.6	96	162.5	109.6	46	203.9	137.6	96	245.4	165.5
47	39.0	26.3	97	80.4	54.2	47	121.9	82.2	97	163.3	110.2	47	204.8	138.1	97	246.2	166.1
48	39.8	26.8	98	81.2	54.8	48	122.7	82.8	98	164.1	110.7	48	205.6	138.7	98	247.0	166.6
49	40.6	27.4	99	82.1	55.4	49	123.5	83.3	99	165.0	111.3	49	206.4	139.2	99	247.9	167.2
50	41.5	28.0	100	83.9	55.9	50	124.4	83.9	100	165.8	111.8	50	207.3	139.8	100	248.7	167.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 56 Deg.



# Difference of Latitude and Departure for 35 Deg.

35

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	41.8	29.2	101	82.7	57.9	151	123.7	86.6	201	164.6	115.3	251	205.6	143.9
2	01.6	01.1	52	42.6	29.8	02	83.5	58.5	52	124.5	87.2	02	165.4	115.8	52	206.4	144.5
3	02.5	01.7	53	43.4	30.4	03	84.4	58.1	53	125.3	87.7	03	166.3	116.4	53	207.2	145.1
4	03.3	02.3	54	44.2	31.0	04	85.2	59.6	54	126.1	88.3	04	167.1	117.0	54	208.0	145.7
5	04.1	02.9	55	45.0	31.5	05	86.0	60.2	55	126.9	88.9	05	167.9	117.6	55	208.8	146.2
6	04.9	03.4	56	45.9	32.1	106	86.8	60.8	156	127.8	89.5	206	168.7	118.1	256	209.6	146.8
7	05.7	04.0	57	46.7	32.7	07	87.6	61.4	57	128.6	90.0	07	169.5	118.7	57	210.5	147.4
8	06.6	04.6	58	47.5	33.3	08	88.5	61.9	58	129.4	90.6	08	170.3	119.3	58	211.3	148.0
9	07.4	05.2	59	48.3	33.8	09	89.3	62.5	59	130.2	91.2	09	171.2	119.9	59	212.1	148.5
10	08.2	05.7	60	49.1	34.4	10	90.1	63.1	60	131.0	91.8	10	172.0	120.4	60	212.9	149.1
11	09.0	06.3	61	50.0	35.0	111	90.9	63.7	161	131.6	92.3	211	172.8	121.0	261	213.8	149.7
12	09.8	07.9	62	50.8	35.6	12	91.7	64.2	62	132.7	92.9	12	173.6	121.6	62	214.6	150.3
13	10.6	07.5	63	51.6	36.1	13	92.5	64.8	63	133.5	93.5	13	174.4	122.2	63	215.4	150.8
14	11.5	08.0	64	52.4	36.7	14	93.4	65.4	64	134.3	94.1	14	175.3	122.7	64	216.2	151.4
15	12.3	08.6	65	53.2	37.3	15	94.2	66.0	65	135.1	94.6	15	176.1	123.3	65	217.0	152.0
16	13.1	09.2	66	54.1	37.9	116	95.0	66.5	166	136.0	95.2	216	176.9	123.9	266	217.8	152.6
17	13.9	09.7	67	54.9	38.4	17	95.8	67.1	67	136.8	95.8	17	177.7	124.4	67	218.7	153.1
18	14.7	10.3	68	55.7	39.0	18	96.6	67.7	68	137.6	96.3	18	178.5	125.0	68	219.5	153.7
19	15.6	10.9	69	56.5	39.6	19	97.5	68.2	69	138.4	96.9	19	179.4	125.6	69	220.3	154.3
20	16.4	11.5	70	57.3	40.1	20	98.3	68.8	70	139.2	97.5	20	180.2	126.2	70	221.1	154.8
21	17.2	12.0	71	58.1	40.7	121	99.1	69.4	171	140.0	98.1	221	181.0	126.7	271	221.9	155.4
22	18.0	12.6	72	59.0	41.3	22	99.9	70.0	72	140.9	98.6	22	181.8	127.3	72	222.8	156.0
23	18.8	13.2	73	59.8	41.9	23	100.7	70.5	73	141.7	99.2	23	182.6	127.9	73	223.6	156.6
24	19.6	13.8	74	60.6	42.4	24	101.6	71.1	74	142.5	99.8	24	183.5	128.5	74	224.4	157.1
25	20.5	14.3	75	61.4	43.0	25	102.4	71.7	75	143.3	100.4	25	184.3	129.0	75	225.2	157.7
26	21.3	14.9	76	62.2	43.6	126	103.2	72.3	176	144.1	100.9	226	185.1	129.6	276	226.0	158.3
27	22.1	15.5	77	63.1	44.2	27	104.0	72.8	77	145.0	101.5	27	185.9	130.2	77	226.9	158.9
28	22.9	16.1	78	63.9	44.7	28	104.8	73.4	78	145.8	102.1	28	186.7	130.8	78	227.7	159.4
29	23.8	16.6	79	64.7	45.3	29	105.6	74.0	79	146.6	102.7	29	187.5	131.3	79	228.5	160.0
30	24.6	17.2	80	65.5	45.9	30	106.5	74.6	80	147.4	103.2	30	188.4	131.9	80	229.3	160.6
31	25.4	17.8	81	66.3	46.5	131	107.3	75.1	181	148.2	103.8	231	189.2	132.5	281	230.1	161.2
32	26.2	18.4	82	67.2	47.0	32	108.1	75.7	82	149.1	104.4	32	190.0	133.1	82	231.0	161.7
33	27.0	18.9	83	68.0	47.6	33	108.9	76.3	83	149.9	105.0	33	190.8	133.6	83	231.8	162.3
34	27.8	19.5	84	68.8	48.2	34	109.7	76.8	84	150.7	105.5	34	191.6	134.2	84	232.6	162.9
35	28.7	20.1	85	69.6	48.7	35	110.6	77.4	85	151.5	106.1	35	192.5	134.8	85	233.4	163.4
36	29.5	20.6	86	70.4	49.3	136	111.4	78.0	186	152.3	106.7	236	193.3	135.3	286	234.2	164.0
37	30.3	21.2	87	71.3	49.9	37	112.2	78.6	87	153.1	107.2	37	194.1	135.9	87	235.0	164.6
38	31.1	21.8	88	72.1	50.5	38	113.0	79.1	88	154.0	107.8	38	194.9	136.5	88	235.9	165.2
39	31.9	22.4	89	72.9	51.0	39	113.8	79.7	89	154.8	108.4	39	195.7	137.1	89	236.7	165.7
40	32.8	22.9	90	73.7	51.6	40	114.6	80.3	90	155.6	109.0	40	196.6	137.6	90	237.5	166.3
41	33.6	23.5	91	74.5	52.2	141	115.5	80.9	91	156.4	109.5	241	197.4	138.2	291	238.3	166.9
42	34.4	24.1	92	75.3	52.8	42	116.3	81.4	92	157.2	110.1	42	198.2	138.8	92	239.1	167.5
43	35.2	24.7	93	76.2	53.3	43	117.1	82.0	93	158.1	110.7	43	199.0	139.4	93	240.0	168.0
44	36.0	25.2	94	77.0	53.9	44	117.9	82.6	94	158.9	111.3	44	199.8	139.9	94	240.8	168.6
45	36.9	25.8	95	77.8	54.5	45	118.5	83.2	95	159.7	111.8	45	200.6	140.5	95	241.6	169.2
46	37.7	26.4	96	78.6	55.1	146	119.6	83.7	196	160.5	112.4	246	201.5	141.1	296	242.4	169.8
47	38.5	27.0	97	79.4	55.6	47	120.4	84.3	97	161.3	113.0	47	202.3	141.7	97	243.2	170.3
48	39.3	27.5	98	80.3	56.2	48	121.2	84.9	98	162.2	113.6	48	203.1	142.2	98	244.1	170.9
49	40.1	28.1	99	81.1	56.8	49	122.0	85.5	99	163.0	114.1	49	203.9	142.8	99	244.9	171.5
50	41.0	28.7	100	81.9	57.4	150	122.8	86.0	200	163.8	114.7	250	204.7	143.4	300	245.7	172.1
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 55 Deg.

# 36 Difference of Latitude and Departure for 36 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	41.3	30.0	101	81.7	59.4	151	122.2	88.8	201	162.6	118.1	251	203.1	147.5
2	01.6	01.2	52	42.1	30.6	102	82.5	60.0	152	123.0	89.3	202	163.4	118.7	252	203.9	148.1
3	02.4	01.8	53	42.9	31.2	103	83.3	60.5	153	123.8	89.9	203	164.2	119.3	253	204.7	148.7
4	03.2	02.4	54	43.7	31.7	104	84.1	61.1	154	124.6	90.5	204	165.0	119.9	254	205.5	149.3
5	04.0	02.9	55	44.5	32.3	105	84.9	61.7	155	125.4	91.1	205	165.8	120.5	255	206.3	149.9
6	04.9	03.5	56	45.3	32.9	106	85.8	62.3	156	126.2	91.7	206	166.7	121.1	256	207.1	150.5
7	05.7	04.1	57	46.1	33.5	107	86.6	62.9	157	127.0	92.3	207	167.5	121.7	257	207.9	151.1
8	06.5	04.7	58	46.9	34.1	108	87.4	63.5	158	127.8	92.9	208	168.3	122.3	258	208.7	151.7
9	07.3	05.3	59	47.7	34.7	109	88.2	64.1	159	128.6	93.5	209	169.1	122.8	259	209.5	152.2
10	08.1	05.9	60	48.5	35.3	110	89.0	64.7	160	129.4	94.0	210	169.9	123.4	260	210.3	152.8
11	08.9	06.5	61	49.3	35.9	111	89.8	65.2	161	130.2	94.6	211	170.7	124.0	261	211.1	153.4
12	09.7	07.1	62	50.2	36.4	112	90.6	65.8	162	131.1	95.2	212	171.5	124.9	262	212.0	154.0
13	10.5	07.6	63	51.0	37.0	113	91.4	66.4	163	131.9	95.8	213	172.3	125.2	263	213.8	154.6
14	11.3	08.2	64	51.8	37.6	114	92.2	67.0	164	132.7	96.4	214	173.1	125.8	264	213.6	155.2
15	12.1	08.8	65	52.6	38.2	115	93.0	67.6	165	133.5	97.0	215	173.9	126.4	265	214.4	155.8
16	12.9	09.4	66	53.4	38.8	116	93.8	68.2	166	134.3	97.6	216	174.7	127.0	266	215.2	156.4
17	13.8	10.0	67	54.2	39.4	117	94.7	68.8	167	135.1	98.2	217	175.6	127.6	267	216.0	156.9
18	14.6	10.6	68	55.0	40.0	118	95.5	69.4	168	135.9	98.7	218	176.4	128.1	268	216.8	157.5
19	15.4	11.2	69	55.8	40.6	119	96.3	69.9	169	136.7	99.3	219	177.2	128.7	269	217.6	158.1
20	16.2	11.8	70	56.6	41.1	120	97.1	70.5	170	137.5	99.9	220	178.0	129.3	270	218.4	158.7
21	17.0	12.3	71	57.4	41.7	121	97.9	71.1	171	138.3	100.5	221	178.8	129.9	271	219.2	159.3
22	17.8	12.9	72	58.2	42.3	122	98.7	71.7	172	139.1	101.1	222	179.6	130.5	272	220.0	159.9
23	18.6	13.5	73	59.1	42.9	123	99.5	72.3	173	140.0	101.7	223	180.4	131.1	273	220.9	160.5
24	19.4	14.1	74	59.9	43.5	124	100.3	72.9	174	140.8	102.3	224	181.2	131.7	274	221.7	161.1
25	20.2	14.7	75	60.7	44.1	125	101.1	73.5	175	141.6	102.9	225	182.0	132.3	275	222.5	161.6
26	21.0	15.3	76	61.5	44.7	126	101.9	74.1	176	142.4	103.5	226	182.8	132.8	276	223.3	162.2
27	21.8	15.9	77	62.3	45.3	127	102.7	74.7	177	143.2	104.0	227	183.6	133.4	277	224.1	162.8
28	22.7	16.5	78	63.1	45.8	128	103.6	75.2	178	144.0	104.6	228	184.5	134.0	278	224.9	163.4
29	23.5	16.0	79	63.9	46.4	129	104.4	75.8	179	144.8	105.2	229	185.3	134.6	279	225.7	164.0
30	24.3	17.6	80	64.7	47.0	130	105.2	76.4	180	145.6	105.8	230	186.1	135.2	280	226.5	164.6
31	25.1	18.2	81	65.5	47.6	131	106.0	77.0	181	146.4	106.4	231	186.9	135.8	281	227.3	165.2
32	25.9	18.8	82	66.3	48.2	132	106.8	77.6	182	147.2	107.0	232	187.7	136.4	282	228.1	165.8
33	26.7	19.4	83	67.1	48.8	133	107.6	78.2	183	148.0	107.6	233	188.5	137.0	283	228.9	166.3
34	27.5	20.0	84	68.0	49.4	134	108.4	78.8	184	148.9	108.2	234	189.3	137.5	284	229.8	166.9
35	28.3	20.6	85	68.8	50.0	135	109.2	79.4	185	149.7	108.7	235	190.1	138.1	285	230.6	167.5
36	29.1	21.2	86	69.6	50.6	136	110.0	79.9	186	150.5	109.3	236	190.9	138.7	286	231.4	168.1
37	29.9	21.7	87	70.4	51.1	137	110.8	80.5	187	151.3	109.9	237	191.7	139.3	287	232.2	168.7
38	30.7	22.3	88	71.2	51.7	138	111.6	81.1	188	152.1	110.5	238	192.5	139.9	288	233.0	169.3
39	31.6	22.9	89	72.0	52.3	139	112.5	81.7	189	152.9	111.1	239	193.3	140.5	289	233.8	169.9
40	32.4	23.5	90	72.8	52.9	140	113.3	82.3	190	153.7	111.7	240	194.2	141.1	290	234.6	170.5
41	33.2	24.1	91	73.6	53.5	141	114.1	82.9	191	154.5	112.3	241	195.0	141.7	291	235.4	171.0
42	34.0	24.7	92	74.4	54.1	142	114.9	83.5	192	155.3	112.9	242	195.8	142.2	292	236.2	171.6
43	34.8	25.3	93	75.2	54.7	143	115.7	84.1	193	156.1	113.4	243	196.6	142.8	293	237.0	172.2
44	35.6	25.9	94	76.0	55.3	144	116.5	84.6	194	156.9	114.0	244	197.4	143.4	294	237.8	172.8
45	36.4	26.5	95	76.9	55.8	145	117.3	85.2	195	157.8	114.6	245	198.2	144.0	295	238.7	173.4
46	37.2	27.0	96	77.7	56.4	146	118.1	85.8	196	158.6	115.2	246	199.0	144.6	296	239.5	174.0
47	38.0	27.6	97	78.5	57.0	147	118.9	86.4	197	159.4	115.8	247	199.8	145.2	297	240.3	174.6
48	38.8	28.2	98	79.3	57.6	148	119.7	87.0	198	160.2	116.4	248	200.6	145.8	298	241.1	175.2
49	39.6	28.8	99	80.1	58.2	149	120.5	87.6	199	161.0	117.0	249	201.4	146.4	299	241.9	175.7
50	40.5	29.4	100	80.9	58.8	150	121.3	88.2	200	161.8	117.6	250	202.2	146.9	300	242.7	176.3
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 54 Deg.



# Difference of Latitude and Departure for 37 Deg.

37

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	40.7	30.7	101	80.7	60.8	151	120.6	90.9	201	160.5	121.0	251	200.4	151.0
2	01.6	01.2	52	41.5	31.3	02	81.5	61.4	52	121.4	91.5	02	161.3	121.5	52	201.2	151.6
3	02.4	01.8	53	42.3	31.9	03	82.3	62.0	53	122.2	92.1	03	162.1	122.2	53	202.0	152.2
4	03.2	02.4	54	43.1	32.5	04	83.1	62.6	54	123.0	92.7	04	162.9	122.8	54	202.8	152.9
5	04.0	03.0	55	43.9	33.1	05	83.9	63.2	55	123.8	93.3	05	163.7	123.4	55	203.6	153.5
6	04.8	03.6	56	44.7	33.7	106	84.7	63.8	156	124.6	93.9	206	164.5	124.0	256	204.4	154.1
7	05.6	04.2	57	45.5	34.3	07	85.5	64.4	57	125.4	94.5	07	165.3	124.6	57	205.2	154.7
8	06.4	04.8	58	46.3	34.9	08	86.2	65.0	58	126.2	95.1	08	166.1	125.2	58	206.0	155.3
9	07.2	05.4	59	47.1	35.5	09	87.0	65.6	59	127.0	95.7	09	166.9	125.8	59	206.8	155.9
10	08.0	06.0	60	47.9	36.1	10	87.8	66.2	60	127.8	96.3	10	167.7	126.4	260	207.6	156.5
11	08.8	06.6	61	48.7	36.7	111	88.6	66.8	161	128.6	96.9	211	168.5	127.0	261	208.4	157.1
12	09.6	07.2	62	49.5	37.3	12	89.4	67.4	62	129.4	97.5	12	169.3	127.6	62	209.2	157.7
13	10.4	07.8	63	50.3	37.9	13	90.2	68.0	63	130.2	98.1	13	170.1	128.2	63	210.0	158.3
14	11.2	08.4	64	51.1	38.5	14	91.0	68.6	64	131.0	98.7	14	170.9	128.8	64	210.8	158.9
15	12.0	09.0	65	51.9	39.1	15	91.8	69.2	65	131.8	99.3	15	171.7	129.4	65	211.6	159.5
16	12.8	09.6	66	52.7	39.7	116	92.6	69.8	166	132.6	99.9	216	172.5	130.0	266	212.4	160.1
17	13.6	10.2	67	53.5	40.3	17	93.4	70.4	67	133.4	100.5	17	173.3	130.6	67	213.2	160.7
18	14.4	10.8	68	54.3	40.9	18	94.2	71.0	68	134.2	101.1	18	174.1	131.2	68	214.0	161.3
19	15.2	11.4	69	55.1	41.5	19	95.0	71.6	69	135.0	101.7	19	174.9	131.8	69	214.8	161.9
20	16.0	12.0	70	55.9	42.1	20	95.8	72.2	70	135.8	102.3	20	175.7	132.4	70	215.6	162.5
21	16.8	12.6	71	56.7	42.7	121	96.6	72.8	171	136.6	102.9	221	176.5	133.0	271	216.4	163.1
22	17.6	13.2	72	57.5	43.3	22	97.4	73.4	72	137.4	103.5	22	177.3	133.6	72	217.2	163.7
23	18.4	13.8	73	58.3	43.9	23	98.2	74.0	73	138.2	104.1	23	178.1	134.2	73	218.0	164.3
24	19.2	14.4	74	59.1	44.5	24	99.0	74.6	74	139.0	104.7	24	178.9	134.8	74	218.8	164.9
25	20.0	15.0	75	59.9	45.1	25	99.8	75.2	75	139.8	105.3	25	179.7	135.4	75	219.6	165.5
26	20.8	15.6	76	60.7	45.7	126	100.6	75.8	176	140.6	105.9	226	180.5	136.0	276	220.4	166.1
27	21.6	16.2	77	61.5	46.3	27	101.4	76.4	77	141.4	106.5	27	181.3	136.6	77	221.2	166.7
28	22.4	16.9	78	62.3	46.9	28	102.2	77.0	78	142.2	107.1	28	182.1	137.2	78	222.0	167.3
29	23.2	17.5	79	63.1	47.5	29	103.0	77.6	79	142.9	107.7	29	182.9	137.8	79	222.8	167.9
30	24.0	18.1	80	63.9	48.1	30	103.8	78.2	80	143.7	108.3	30	183.7	138.4	80	223.6	168.5
31	24.8	18.7	81	64.7	48.7	131	104.6	78.8	181	144.5	108.9	231	184.5	139.0	281	224.4	169.1
32	25.6	19.3	82	65.5	49.3	32	105.4	79.4	82	145.3	109.5	32	185.3	139.6	82	225.2	169.7
33	26.4	19.9	83	66.3	49.9	33	106.2	80.0	83	146.1	110.1	33	186.1	140.2	83	226.0	170.3
34	27.2	20.5	84	67.1	50.6	34	107.0	80.6	84	146.9	110.7	34	186.9	140.8	84	226.8	170.9
35	28.0	21.1	85	67.9	51.2	35	107.8	81.2	85	147.7	111.3	35	187.7	141.4	85	227.6	171.5
36	28.7	21.7	86	68.7	51.8	136	108.6	81.8	186	148.5	111.9	236	188.5	142.0	286	228.4	172.1
37	29.5	22.3	87	69.5	52.4	37	109.4	82.4	87	149.3	112.5	37	189.3	142.6	87	229.2	172.7
38	30.3	22.9	88	70.3	53.0	38	110.2	83.0	88	150.1	113.1	38	190.1	143.2	88	230.0	173.3
39	31.1	23.5	89	71.1	53.6	39	111.0	83.6	89	150.9	113.7	39	190.9	143.8	89	230.8	173.9
40	31.9	24.1	90	71.9	54.2	40	111.8	84.2	90	151.7	114.3	40	191.7	144.4	90	231.6	174.5
41	32.7	24.7	91	72.7	54.8	141	112.6	84.9	191	152.5	114.9	241	192.5	145.0	291	232.4	175.1
42	33.5	25.3	92	73.5	55.4	42	113.4	85.5	92	153.3	115.5	42	193.3	145.6	92	233.2	175.7
43	34.3	25.9	93	74.3	56.0	43	114.2	86.1	93	154.1	116.1	43	194.1	146.2	93	234.0	176.3
44	35.1	26.5	94	75.1	56.6	44	115.0	86.7	94	154.9	116.7	44	194.9	146.8	94	234.8	176.9
45	35.9	27.1	95	75.9	57.2	45	115.8	87.3	95	155.7	117.3	45	195.7	147.4	95	235.6	177.5
46	36.7	27.7	96	76.7	57.8	146	116.6	87.9	196	156.5	117.9	246	196.5	148.0	296	236.4	178.1
47	37.5	28.3	97	77.5	58.4	47	117.4	88.5	97	157.3	118.6	47	197.3	148.6	97	237.2	178.7
48	38.3	28.9	98	78.3	59.0	48	118.2	89.1	98	158.1	119.2	48	198.1	149.2	98	238.0	179.3
49	39.1	29.5	99	79.1	59.6	49	119.0	89.6	99	158.9	119.8	49	198.9	149.8	99	238.8	179.9
50	39.9	30.1	100	79.9	60.2	150	119.8	90.3	200	159.7	120.4	250	199.7	150.4	300	239.6	180.5
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

M

for 53 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
100.8	00.6		51	40.2	31.4	101	79.6	62.2	151	119.0	93.0	201	158.4	123.8	251	197.8	154.5
201.6	01.2		52	41.0	32.0	02	80.4	62.8	52	119.8	93.6	02	159.2	124.4	52	198.5	155.2
302.4	01.8		53	41.8	32.6	03	81.2	63.4	53	120.5	94.2	03	159.9	125.0	53	199.3	155.8
403.2	02.5		54	42.5	33.2	04	81.9	64.0	54	121.3	94.8	04	160.7	125.6	54	200.1	156.4
503.9	03.1		55	43.3	33.9	05	82.7	64.6	55	122.1	95.4	05	161.5	126.2	55	200.9	157.0
604.7	03.7		56	44.1	34.5	106	83.5	65.3	156	122.9	96.0	206	162.3	126.8	256	201.7	157.6
705.5	04.3		57	44.9	35.1	07	84.3	65.9	57	123.7	96.7	07	163.1	127.4	57	202.1	158.2
806.3	04.9		58	45.7	35.7	08	85.1	66.5	58	124.5	97.3	08	163.9	128.1	58	203.3	158.9
907.1	05.5		59	46.5	36.3	09	85.9	67.1	59	125.3	97.9	09	164.7	128.7	59	204.1	159.5
1007.9	06.2		60	47.3	36.9	10	86.7	67.7	60	126.1	98.5	10	165.5	129.3	60	204.9	160.1
1108.7	06.8		61	48.1	37.6	111	87.5	68.3	161	126.9	99.1	211	166.2	129.9	261	205.6	160.7
1209.5	07.4		62	48.9	38.2	12	88.2	69.0	62	127.6	99.7	12	167.0	130.5	62	206.4	161.3
1310.2	08.0		63	49.6	38.8	13	89.0	69.6	63	128.4	100.4	13	167.8	131.1	63	207.2	161.9
1411.0	08.6		64	50.4	39.4	14	89.8	70.2	64	129.2	101.0	14	168.6	131.8	64	208.0	162.5
1511.8	09.2		65	51.2	40.0	15	90.6	70.8	65	130.0	101.6	15	169.4	132.4	65	208.8	163.2
1612.6	09.9		66	52.0	40.6	116	91.4	71.4	166	130.8	102.2	216	170.2	133.0	266	209.6	163.8
1713.4	10.5		67	52.8	41.3	17	92.2	72.0	67	131.6	102.8	17	171.0	133.6	67	210.4	164.4
1814.2	11.1		68	53.6	41.9	18	93.0	72.7	68	132.4	103.4	18	171.8	134.2	68	211.2	165.0
1915.0	11.7		69	54.4	42.5	19	93.8	73.3	69	133.2	104.1	19	172.5	134.8	69	211.9	165.6
2015.8	12.3		70	55.2	43.1	20	94.5	73.9	70	133.9	104.7	20	173.3	135.5	70	212.7	166.2
2116.5	12.9		71	55.9	43.7	121	95.3	74.5	171	134.7	105.3	221	174.1	136.1	271	213.5	166.9
2217.3	13.5		72	56.7	44.3	22	96.1	75.1	72	135.5	105.9	22	174.9	136.7	72	214.3	167.5
2318.1	14.2		73	57.5	44.9	23	96.9	75.7	73	136.3	106.5	23	175.7	137.3	73	215.1	168.1
2418.9	14.8		74	58.3	45.6	24	97.7	76.3	74	137.1	107.1	24	176.5	137.9	74	215.9	168.7
2519.7	15.4		75	59.1	46.2	25	98.5	77.0	75	137.9	107.7	25	177.3	138.5	75	216.7	169.3
2620.5	16.0		76	59.9	46.8	126	99.3	77.6	176	138.7	108.4	226	178.1	139.1	276	217.5	169.9
2721.3	16.6		77	60.7	47.4	27	100.1	78.2	77	139.5	109.0	27	178.9	139.8	77	218.3	170.5
2822.1	17.2		78	61.5	48.0	28	100.9	78.8	78	140.2	109.6	28	179.6	140.4	78	219.1	171.2
2922.9	17.9		79	62.2	48.6	29	101.6	79.4	79	141.0	110.2	29	180.4	141.0	79	219.8	171.8
3023.6	18.5		80	63.0	49.3	30	102.4	80.0	80	141.8	110.8	30	181.2	141.6	80	220.6	172.4
3124.4	19.1		81	63.8	49.9	131	103.2	80.7	181	142.6	111.4	231	182.0	142.2	281	221.4	173.0
3225.2	19.7		82	64.6	50.5	32	104.0	81.3	82	143.4	112.1	32	182.8	142.8	82	222.2	173.6
3326.0	20.3		83	65.4	51.1	33	104.8	81.9	83	144.2	112.7	33	183.6	143.5	83	223.0	174.2
3426.8	20.9		84	66.2	51.7	34	105.6	82.5	84	145.0	113.3	34	184.4	144.1	84	223.8	174.9
3527.6	21.5		85	67.0	52.3	35	106.4	83.1	85	145.8	113.9	35	185.2	144.7	85	224.6	175.5
3628.4	22.2		86	67.8	53.0	136	107.2	83.7	186	146.5	114.5	236	185.9	145.3	286	225.3	176.1
3729.2	22.8		87	68.5	53.6	37	107.9	84.4	87	147.3	115.1	37	186.7	145.9	87	226.1	176.7
3829.9	23.4		88	69.3	54.2	38	108.7	85.0	88	148.1	115.8	38	187.5	146.5	88	226.9	177.3
3930.7	24.0		89	70.1	54.8	39	109.5	85.6	89	148.9	116.4	39	188.3	147.2	89	227.7	177.9
4031.5	24.6		90	70.9	55.4	40	110.3	86.2	90	149.7	117.0	40	189.1	147.8	90	228.5	178.6
4132.3	25.2		91	71.7	56.0	141	111.1	86.8	191	150.5	117.6	241	189.9	148.4	291	229.3	179.2
4233.1	25.9		92	72.5	56.6	42	111.9	87.4	92	151.3	118.2	42	190.7	149.0	92	230.1	179.8
4333.9	26.5		93	73.3	57.3	43	112.7	88.0	93	152.1	118.8	43	191.5	149.6	93	230.9	180.4
4434.7	27.1		94	74.1	57.9	44	113.5	88.7	94	152.9	119.4	44	192.3	150.2	94	231.7	181.0
4535.5	27.7		95	74.9	58.5	45	114.3	89.3	95	153.6	120.1	45	193.0	150.8	95	232.4	181.6
4636.3	28.3		96	75.6	59.1	146	115.1	89.9	196	154.4	120.7	246	193.8	151.4	296	233.2	182.2
4737.1	28.9		97	76.4	59.7	47	115.9	90.5	97	155.2	121.3	47	194.6	152.1	97	234.0	182.9
4837.9	29.6		98	77.2	60.3	48	116.7	91.1	98	156.0	121.9	48	195.4	152.7	98	234.8	183.5
4938.7	30.2		99	78.0	61.0	49	117.5	91.7	99	156.8	122.5	49	196.2	153.3	99	235.6	184.1
5039.5	30.8		100	78.8	61.6	150	118.3	92.4	200	157.6	123.1	250	197.0	153.9	300	236.4	184.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 52 Deg.



# Difference of Latitude and Departure for 39 Deg.

39

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	39.6	32.1	101	78.5	63.6	151	117.3	95.0	201	156.2	126.5	251	195.1	158.0
2	01.6	01.3	52	40.4	32.7	02	79.3	64.2	52	118.1	95.7	02	157.0	127.1	52	195.8	158.6
3	02.3	01.9	53	41.2	33.4	03	80.0	64.8	53	118.9	96.3	03	157.8	127.7	53	196.6	159.2
4	03.1	02.5	54	42.0	34.0	04	80.8	65.4	54	119.7	96.9	04	158.5	128.4	54	197.4	159.8
5	03.9	03.1	55	42.7	34.6	05	81.6	66.1	55	120.5	97.5	05	159.3	129.0	55	198.2	160.5
6	04.7	03.8	56	43.5	35.2	06	82.4	66.7	56	121.2	98.2	06	160.1	129.6	56	198.9	161.1
7	05.4	04.4	57	44.3	35.9	07	83.1	67.3	57	122.0	98.8	07	160.9	130.3	57	199.7	161.7
8	06.2	05.0	58	45.1	36.5	08	83.9	68.0	58	122.8	99.4	08	161.6	130.9	58	200.5	162.4
9	07.0	05.7	59	45.8	37.1	09	84.7	68.6	59	123.6	100.1	09	162.4	131.5	59	201.3	163.0
10	07.8	06.3	60	46.6	37.8	10	85.5	69.3	60	124.3	100.7	10	163.2	132.2	60	202.0	163.6
11	08.5	06.9	61	47.4	38.4	11	86.3	69.9	61	125.1	101.3	11	164.0	132.8	61	202.8	164.2
12	09.3	07.6	62	48.2	39.0	12	87.0	70.5	62	125.9	101.9	12	164.7	133.4	62	203.6	164.9
13	10.1	08.2	63	49.0	39.6	13	87.8	71.1	63	126.7	102.6	13	165.5	134.0	63	204.4	165.5
14	10.9	08.8	64	49.7	40.3	14	88.6	71.7	64	127.4	103.2	14	166.3	134.7	64	205.2	166.1
15	11.7	09.4	65	50.5	40.9	15	89.4	72.4	65	128.2	103.8	15	167.1	135.3	65	205.9	166.8
16	12.4	10.1	66	51.3	41.5	16	90.1	73.0	66	129.0	104.5	16	167.9	135.9	66	206.7	167.4
17	13.2	10.7	67	52.1	42.2	17	90.9	73.6	67	129.8	105.1	17	168.6	136.6	67	207.5	168.0
18	14.0	11.3	68	52.8	42.8	18	91.7	74.3	68	130.6	105.7	18	169.4	137.2	68	208.3	168.7
19	14.8	12.0	69	53.6	43.4	19	92.5	74.9	69	131.3	106.4	19	170.2	137.8	69	209.0	169.3
20	15.5	12.6	70	54.4	44.1	20	93.3	75.5	70	132.1	107.0	20	171.0	138.4	70	209.8	169.9
21	16.3	13.2	71	55.2	44.7	21	94.0	76.1	71	132.9	107.6	21	171.7	139.1	71	210.6	170.5
22	17.1	13.8	72	56.0	45.3	22	94.8	76.8	72	133.7	108.2	22	172.5	139.7	72	211.4	171.2
23	17.9	14.5	73	56.7	45.9	23	95.6	77.4	73	134.4	108.9	23	173.3	140.3	73	212.1	171.8
24	18.7	15.1	74	57.5	46.6	24	96.4	78.0	74	135.2	109.5	24	174.1	141.0	74	212.9	172.4
25	19.4	15.7	75	58.3	47.2	25	97.1	78.7	75	136.0	110.1	25	174.8	141.6	75	213.7	173.1
26	20.2	16.4	76	59.1	47.8	26	97.9	79.3	76	136.8	110.8	26	175.6	142.2	76	214.5	173.7
27	21.0	17.0	77	59.8	48.5	27	98.7	79.9	77	137.5	111.4	27	176.4	142.9	77	215.3	174.3
28	21.8	17.6	78	60.6	49.1	28	99.5	80.6	78	138.3	112.0	28	177.2	143.5	78	216.0	174.9
29	22.5	18.2	79	61.4	49.7	29	100.2	81.2	79	139.1	112.6	29	178.0	144.1	79	216.8	175.6
30	23.3	18.9	80	62.2	50.3	30	101.0	81.8	80	139.9	113.3	30	178.7	144.7	80	217.6	176.2
31	24.1	19.5	81	62.9	51.0	31	101.8	82.4	81	140.7	113.9	31	179.5	145.4	81	218.4	176.8
32	24.9	20.1	82	63.7	51.6	32	102.6	83.1	82	141.4	114.5	32	180.3	146.0	82	219.1	177.5
33	25.6	20.8	83	64.5	52.2	33	103.4	83.7	83	142.2	115.2	33	181.1	146.6	83	219.9	178.1
34	26.4	21.4	84	65.3	52.9	34	104.1	84.3	84	143.0	115.8	34	181.8	147.3	84	220.7	178.7
35	27.2	22.0	85	66.1	53.5	35	104.9	85.0	85	143.8	116.4	35	182.6	147.9	85	221.5	179.4
36	28.0	22.7	86	66.8	54.1	36	105.7	85.6	86	144.5	117.1	36	183.4	148.5	86	222.3	180.0
37	28.8	23.3	87	67.6	54.7	37	106.5	86.2	87	145.3	117.7	37	184.2	149.1	87	223.0	180.6
38	29.5	23.9	88	68.4	55.4	38	107.2	86.8	88	146.1	118.3	38	185.0	149.8	88	223.8	181.2
39	30.3	24.5	89	69.2	56.0	39	108.0	87.5	89	146.9	118.9	39	185.7	150.4	89	224.6	181.9
40	31.1	25.2	90	69.9	56.6	40	108.8	88.1	90	147.6	119.6	40	186.5	151.0	90	225.4	182.5
41	31.9	25.8	91	70.7	57.3	41	109.6	88.7	91	148.4	120.2	41	187.3	151.7	91	226.1	183.1
42	32.6	26.4	92	71.5	57.9	42	110.3	89.4	92	149.2	120.8	42	188.1	152.3	92	226.9	183.8
43	33.4	27.1	93	72.3	58.5	43	111.1	90.0	93	150.0	121.5	43	188.8	152.9	93	227.7	184.4
44	34.2	27.7	94	73.0	59.2	44	111.9	90.6	94	150.8	122.1	44	189.6	153.6	94	228.5	185.0
45	35.0	28.3	95	73.8	59.8	45	112.7	91.2	95	151.5	122.7	45	190.4	154.2	95	229.2	185.6
46	35.7	28.9	96	74.6	60.4	46	113.5	91.9	96	152.3	123.3	46	191.2	154.8	96	230.0	186.3
47	36.5	29.6	97	75.4	61.0	47	114.2	92.5	97	153.1	124.0	47	191.9	155.4	97	230.8	186.9
48	37.3	30.2	98	76.2	61.7	48	115.0	93.1	98	153.9	124.6	48	192.7	156.1	98	231.6	187.5
49	38.1	30.8	99	76.9	62.3	49	115.8	93.8	99	154.6	125.2	49	193.5	156.7	99	232.4	188.2
50	39.0	31.5	100	77.7	62.9	50	116.6	94.4	100	155.4	125.9	50	194.3	157.3	100	233.2	188.8
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 51 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	39.1	32.8	101	77.4	64.9	151	115.7	97.1	201	154.0	129.2	251	192.3	161.4
2	01.5	01.3	52	39.8	33.4	02	78.1	65.6	52	116.4	97.7	02	154.7	129.9	52	193.0	162.0
3	02.3	01.9	53	40.6	34.1	03	78.9	66.2	53	117.2	98.4	03	155.5	130.5	53	193.8	162.6
4	03.1	02.6	54	41.4	34.7	04	79.7	66.8	54	118.0	99.0	04	156.3	131.1	54	194.6	163.3
5	03.8	03.2	55	42.1	35.3	05	80.4	67.5	55	118.7	99.6	05	157.0	131.8	55	195.3	163.9
6	04.6	03.9	56	42.9	36.0	106	81.2	68.1	156	119.5	100.3	206	157.8	132.4	256	196.1	164.6
7	05.4	04.5	57	43.7	36.6	07	82.0	68.8	57	120.3	100.9	07	158.6	133.1	57	196.9	165.2
8	06.1	05.1	58	44.4	37.3	08	82.7	69.4	58	121.0	101.6	08	159.3	133.7	58	197.6	165.9
9	06.9	05.8	59	45.2	37.9	09	83.5	70.1	59	121.8	102.2	09	160.1	134.4	59	198.4	166.5
10	07.7	06.4	60	46.0	38.6	10	84.3	70.7	60	122.6	102.8	10	160.9	135.0	60	199.2	167.1
11	08.4	07.1	61	46.7	39.2	111	85.0	71.3	161	123.3	103.5	211	161.6	135.6	261	199.9	167.8
12	09.2	07.7	62	47.5	39.9	12	85.8	72.0	62	124.1	104.1	12	162.4	136.3	62	200.7	168.4
13	10.0	08.4	63	48.3	40.5	13	86.6	72.2	63	124.9	104.8	13	163.2	136.9	63	201.4	169.1
14	10.7	09.0	64	49.0	41.1	14	87.3	73.3	64	125.6	105.4	14	163.9	137.6	64	202.2	169.7
15	11.5	09.6	65	49.8	41.8	15	88.1	73.9	65	126.4	106.1	15	164.7	138.2	65	203.0	170.4
16	12.3	10.3	66	50.6	42.4	116	88.9	74.6	166	127.2	106.7	216	165.4	138.8	266	203.7	171.0
17	13.0	10.9	67	51.3	43.1	17	89.6	75.2	67	127.9	107.3	17	166.2	139.5	67	204.5	171.6
18	13.8	11.6	68	52.1	43.7	18	90.4	75.9	68	128.7	108.0	18	167.0	140.1	68	205.3	172.3
19	14.6	12.2	69	52.9	44.4	19	91.2	76.5	69	129.4	108.6	19	167.7	140.8	69	206.0	172.9
20	15.3	12.9	70	53.6	45.0	20	91.9	77.1	70	130.2	109.3	20	168.5	141.4	70	206.8	173.6
21	16.1	13.5	71	54.4	45.6	21	92.7	77.8	171	131.0	109.9	221	169.3	142.1	271	207.6	174.2
22	16.9	14.1	72	55.2	46.3	22	93.4	78.4	72	131.7	110.6	22	170.0	142.7	72	208.3	174.8
23	17.6	14.8	73	55.9	46.9	23	94.2	79.1	73	132.5	111.2	23	170.8	143.3	73	209.1	175.5
24	18.4	15.4	74	56.7	47.6	24	95.0	79.7	74	133.3	111.9	24	171.6	144.0	74	209.9	176.1
25	19.2	16.1	75	57.4	48.2	25	95.7	80.4	75	134.0	112.5	25	172.3	144.6	75	210.6	176.8
26	19.9	16.7	76	58.2	48.8	126	96.5	81.0	176	134.8	113.1	226	173.1	145.3	276	211.4	177.4
27	20.7	17.4	77	59.0	49.5	27	97.3	81.6	77	135.6	113.8	27	173.9	146.0	77	212.2	178.1
28	21.4	18.0	78	59.7	50.5	28	98.0	82.3	78	136.3	114.4	28	174.6	146.6	78	212.9	178.7
29	22.2	18.6	79	60.5	50.8	29	98.8	82.9	79	137.1	115.1	29	175.4	147.2	79	213.7	179.3
30	23.0	19.3	80	61.3	51.4	30	99.6	83.6	80	137.9	115.7	30	176.2	147.9	80	214.5	180.0
31	23.7	19.9	81	62.0	52.1	131	100.3	84.2	181	138.6	116.4	231	176.9	148.5	281	215.2	180.6
32	24.5	20.6	82	62.8	52.7	32	101.1	84.9	82	139.4	117.0	32	177.7	149.1	82	216.0	181.3
33	25.3	21.2	83	63.6	53.4	33	101.9	85.5	83	140.2	117.6	33	178.5	149.8	83	216.8	181.9
34	26.0	21.9	84	64.3	54.0	34	102.6	86.1	84	140.9	118.3	34	179.2	150.4	84	217.5	182.6
35	26.8	22.5	85	65.1	54.6	35	103.4	86.8	85	141.7	118.9	35	180.0	151.1	85	218.3	183.2
36	27.6	23.1	86	65.9	55.3	136	104.2	87.4	186	142.5	119.6	236	180.8	151.7	286	219.1	183.9
37	28.3	23.8	87	66.6	55.9	37	104.9	88.1	87	143.2	120.2	37	181.5	152.4	87	219.8	184.5
38	29.1	24.4	88	67.4	56.6	38	105.7	88.7	88	144.0	120.9	38	182.3	153.0	88	220.6	185.1
39	29.9	25.1	89	68.2	57.2	39	106.5	89.4	89	144.8	121.5	39	183.1	153.6	89	221.4	185.8
40	30.6	25.7	90	68.9	57.9	40	107.2	90.0	90	145.5	122.1	40	183.8	154.3	90	222.1	186.4
41	31.4	26.4	91	69.7	58.5	141	108.0	90.6	191	146.3	122.8	241	184.6	154.9	291	222.9	187.1
42	32.2	27.0	92	70.5	59.1	42	108.8	91.3	92	147.1	123.4	42	185.4	155.6	92	223.7	187.7
43	32.9	27.6	93	71.2	59.8	43	109.5	91.9	93	147.8	124.1	43	186.1	156.2	93	224.4	188.4
44	33.7	28.3	94	72.0	60.4	44	110.3	92.6	94	148.6	124.7	44	186.9	156.9	94	225.2	189.0
45	34.5	28.9	95	72.8	61.1	45	111.1	93.2	95	149.4	125.4	45	187.7	157.5	95	226.0	189.6
46	35.2	29.6	96	73.5	61.7	146	111.8	93.9	196	150.1	126.0	246	188.4	158.1	96	226.7	190.3
47	36.0	30.2	97	74.3	62.4	47	112.6	94.5	97	150.9	126.6	47	189.2	158.8	97	227.5	190.9
48	36.8	30.8	98	75.1	63.0	48	113.4	95.1	98	151.7	127.3	48	190.0	159.4	98	228.3	191.6
49	37.5	31.5	99	75.8	63.6	49	114.1	95.8	99	152.4	127.9	49	190.7	160.1	99	229.0	192.2
50	38.3	32.1	100	76.6	64.3	150	114.9	96.4	200	153.2	128.6	250	191.5	161.7	300	229.8	192.9
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 50 Deg.



# Difference of Latitude and Departure for 41 Deg. 41

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.7	51	38.5	33.5	101	76.2	66.3	151	114.0	99.0	201	151.7	131.8	251	189.4	164.6
2	01.5	01.3	52	39.2	34.1	102	77.0	66.9	152	114.7	99.7	202	152.5	132.5	252	190.2	165.3
3	02.3	02.0	53	40.0	34.8	103	77.7	67.6	153	115.5	100.4	203	153.2	133.2	253	190.9	166.0
4	03.0	02.6	54	40.8	35.4	104	78.5	68.2	154	116.2	101.0	204	154.0	133.8	254	191.7	166.6
5	03.8	03.3	55	41.5	36.1	105	79.2	68.9	155	117.0	101.7	205	154.7	134.5	255	192.5	167.3
6	04.5	03.9	56	42.3	36.7	106	80.0	69.5	156	117.7	102.3	206	155.5	135.1	256	193.2	167.9
7	05.3	04.6	57	43.0	37.4	107	80.8	70.2	157	118.5	103.0	207	156.2	135.8	257	194.0	168.6
8	06.0	05.2	58	43.8	38.0	108	81.5	70.8	158	119.2	103.6	208	157.0	136.4	258	194.7	169.2
9	06.8	05.9	59	44.5	38.7	109	82.3	71.5	159	120.0	104.3	209	157.7	137.1	259	195.5	169.9
10	07.5	06.6	60	45.3	39.4	110	83.0	72.2	160	120.8	105.0	210	158.5	137.7	260	196.2	170.5
11	08.3	07.2	61	46.0	40.0	111	83.8	72.8	161	121.5	105.6	211	159.2	138.4	261	197.0	171.2
12	09.1	07.9	62	46.8	40.7	112	84.5	73.5	162	122.3	106.3	212	160.0	139.1	262	197.7	171.9
13	09.8	08.5	63	47.5	41.3	113	85.3	74.1	163	123.0	106.9	213	160.8	139.7	263	198.5	172.5
14	10.6	09.2	64	48.3	42.0	114	86.0	74.8	164	123.8	107.6	214	161.5	140.4	264	199.2	173.2
15	11.3	09.8	65	49.1	42.6	115	86.8	75.4	165	124.5	108.2	215	162.3	141.0	265	200.0	173.8
16	12.1	10.5	66	49.8	43.3	116	87.5	76.1	166	125.3	108.9	216	163.0	141.7	266	200.8	174.5
17	12.8	11.2	67	50.6	44.0	117	88.3	76.7	167	126.0	109.5	217	163.8	142.3	267	201.5	175.1
18	13.6	11.8	68	51.3	44.6	118	89.1	77.4	168	126.8	110.2	218	164.5	143.0	268	202.3	175.8
19	14.3	12.5	69	52.1	45.3	119	89.8	78.1	169	127.5	110.9	219	165.3	143.6	269	203.0	176.4
20	15.1	13.1	70	52.8	45.9	120	90.6	78.7	170	128.3	111.5	220	166.0	144.3	270	203.8	177.1
21	15.8	13.8	71	53.6	46.6	121	91.3	79.4	171	129.1	112.2	221	166.8	145.0	271	204.5	177.8
22	16.6	14.4	72	54.3	47.2	122	92.1	80.0	172	129.8	112.8	222	167.5	145.6	272	205.3	178.4
23	17.4	15.1	73	55.1	47.9	123	92.8	80.7	173	130.6	113.5	223	168.3	146.3	273	206.0	179.1
24	18.1	15.7	74	55.8	48.5	124	93.6	81.3	174	131.3	114.1	224	169.1	146.9	274	206.8	179.7
25	18.9	16.4	75	56.6	49.2	125	94.3	82.0	175	132.1	114.8	225	169.8	147.6	275	207.5	180.4
26	19.6	17.1	76	57.4	49.9	126	95.1	82.6	176	132.8	115.4	226	170.6	148.2	276	208.3	181.0
27	20.4	17.7	77	58.1	50.5	127	95.8	83.3	177	133.6	116.1	227	171.3	148.9	277	209.1	181.7
28	21.1	18.4	78	58.9	51.2	128	96.6	84.0	178	134.3	116.8	228	172.1	149.6	278	209.8	182.4
29	21.9	19.0	79	59.6	51.8	129	97.4	84.6	179	135.1	117.4	229	172.8	150.2	279	210.6	183.0
30	22.6	19.7	80	60.4	52.5	130	98.1	85.3	180	135.8	118.1	230	173.6	150.9	280	211.3	183.7
31	23.4	20.3	81	61.1	53.1	131	98.9	85.9	181	136.6	118.7	231	174.3	151.5	281	212.1	184.3
32	24.2	21.0	82	61.9	53.8	132	99.6	86.6	182	137.4	119.4	232	175.1	152.2	282	212.8	185.0
33	24.9	21.6	83	62.6	54.4	133	100.4	87.2	183	138.1	120.0	233	175.8	152.8	283	213.6	185.6
34	25.7	22.3	84	63.4	55.1	134	101.1	87.9	184	138.9	120.7	234	176.6	153.5	284	214.3	186.3
35	26.4	23.0	85	64.2	55.8	135	101.9	88.6	185	139.6	121.4	235	177.4	154.1	285	215.0	186.9
36	27.2	23.6	86	64.9	56.4	136	102.6	89.2	186	140.4	122.0	236	178.1	154.8	286	215.8	187.5
37	27.9	24.3	87	65.7	57.1	137	103.4	89.9	187	141.1	122.7	237	178.9	155.5	287	216.6	188.1
38	28.7	24.9	88	66.4	57.7	138	104.2	90.5	188	141.9	123.3	238	179.6	156.1	288	217.4	188.8
39	29.4	25.6	89	67.2	58.4	139	104.9	91.2	189	142.6	124.0	239	180.4	156.8	289	218.1	189.4
40	30.2	26.2	90	67.9	59.0	140	105.7	91.8	190	143.4	124.6	240	181.1	157.4	290	218.9	190.0
41	30.9	26.9	91	68.7	59.7	141	106.4	92.5	191	144.2	125.3	241	181.9	158.1	291	219.6	190.6
42	31.7	27.6	92	69.4	60.4	142	107.2	93.1	192	144.9	125.9	242	182.6	158.9	292	220.4	191.2
43	32.5	28.2	93	70.2	61.0	143	107.9	93.8	193	145.7	126.6	243	183.4	159.4	293	221.1	191.8
44	33.2	28.9	94	70.9	61.7	144	108.7	94.5	194	146.4	127.3	244	184.2	160.0	294	221.9	192.4
45	34.0	29.5	95	71.7	62.3	145	109.4	95.1	195	147.2	127.9	245	184.9	160.7	295	222.6	193.0
46	34.7	30.2	96	72.5	63.0	146	110.2	95.8	196	147.9	128.6	246	185.7	161.4	296	223.4	193.6
47	35.5	30.8	97	73.2	63.6	147	110.9	96.4	197	148.7	129.3	247	186.4	162.0	297	224.2	194.2
48	36.2	31.5	98	74.0	64.3	148	111.7	97.1	198	149.4	129.9	248	187.2	162.9	298	224.9	194.8
49	37.0	32.1	99	74.7	64.9	149	112.5	97.7	199	150.2	130.6	249	187.9	163.3	299	225.7	195.4
50	37.7	32.8	100	75.5	65.6	150	113.2	98.4	200	150.9	131.2	250	188.7	163.8	300	226.5	196.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

34 34 107

N

for 49 Deg.

# 42 Difference of Latitude and Departure for 42 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
100.7	00.7	51.37.9	34.1	101	75.0	67.6	151	112.2	101.0	201	149.3	134.5	251	186.5	167.9		
201.5	01.3	52.38.6	34.8	02	75.8	68.2	52	112.9	101.7	02	150.1	135.1	52	187.2	168.6		
302.2	02.0	53.39.4	35.5	03	76.5	68.9	53	113.7	102.4	03	150.8	135.8	53	187.9	169.3		
403.0	02.7	54.40.1	36.1	04	77.3	69.6	54	114.4	103.0	04	151.5	136.5	54	188.7	169.9		
503.7	03.3	55.40.9	36.8	05	78.0	70.2	55	115.1	103.7	05	152.3	137.1	55	189.4	170.6		
604.5	04.0	56.41.6	37.5	106	78.7	70.9	156	115.9	104.4	206	153.0	137.8	256	190.2	171.3		
705.2	04.7	57.42.3	38.1	07	79.5	71.6	57	116.6	105.0	07	153.8	138.5	57	190.9	171.9		
805.9	05.4	58.43.1	38.8	08	80.2	72.3	58	117.4	105.7	08	154.5	139.1	58	191.7	172.6		
906.7	06.0	59.43.8	39.5	09	81.0	72.9	59	118.1	106.4	09	155.3	139.8	59	192.4	173.3		
1007.4	06.7	60.44.6	40.1	10	81.7	73.6	60	118.9	107.0	10	156.0	140.5	60	193.1	173.9		
1108.2	07.4	61.45.3	40.8	111	82.5	74.3	161	119.6	107.7	211	156.7	141.2	261	193.8	174.6		
1208.9	08.0	62.46.1	41.5	12	83.2	74.9	62	120.3	108.4	12	157.5	141.8	62	194.6	175.3		
1309.7	08.7	63.46.8	42.1	13	83.9	75.6	63	121.1	109.0	13	158.2	142.5	63	195.4	175.9		
1410.4	09.4	64.47.5	42.8	14	84.7	76.3	64	121.8	109.7	14	159.0	143.2	64	196.1	176.6		
1511.1	10.0	65.48.3	43.5	15	85.4	76.9	65	122.6	110.4	15	159.7	143.8	65	196.9	177.3		
1611.9	10.7	66.49.0	44.2	116	86.2	77.6	166	123.3	111.0	216	160.5	144.5	266	197.6	177.9		
1712.6	11.4	67.49.9	44.8	17	86.9	78.3	67	124.1	111.7	17	161.2	145.2	67	198.3	178.6		
1813.4	12.0	68.50.5	45.5	18	87.7	78.9	68	124.8	112.4	18	161.9	145.8	68	199.1	179.3		
1914.1	12.7	69.51.3	46.2	19	88.4	79.6	69	125.5	113.1	19	162.7	146.5	69	199.8	180.0		
2014.9	13.4	70.52.0	46.8	20	89.1	80.3	70	126.3	113.7	20	163.4	147.2	70	200.6	180.6		
2115.6	14.0	71.52.7	47.5	121	89.9	80.9	171	127.0	114.4	221	164.2	147.8	271	201.3	181.3		
2216.3	14.7	72.53.5	48.2	22	90.6	81.6	72	127.8	115.1	22	164.9	148.5	72	202.1	182.0		
2317.1	15.4	73.54.2	48.8	23	91.4	82.3	73	128.5	115.7	23	165.7	149.2	73	202.8	182.6		
2417.8	16.1	74.55.0	49.5	24	92.1	83.0	74	129.3	116.4	24	166.4	149.9	74	203.5	183.3		
2518.6	16.7	75.55.7	50.2	25	92.9	83.6	75	130.0	117.1	25	167.1	150.5	75	204.3	184.0		
2619.3	17.4	76.56.5	50.8	126	93.6	84.3	176	130.7	117.7	226	167.9	151.2	276	205.0	184.6		
2720.1	18.1	77.57.2	51.5	27	94.3	85.0	77	131.5	118.4	27	168.6	151.9	77	205.8	185.3		
2820.8	18.7	78.57.9	52.2	28	95.1	85.6	78	132.2	119.1	28	169.4	152.5	78	206.5	186.0		
2921.5	19.4	79.58.7	52.9	29	95.8	86.3	79	133.0	119.7	29	170.1	153.2	79	207.3	186.6		
3022.3	20.1	80.59.4	53.5	30	96.6	87.0	80	133.7	120.4	30	170.9	153.9	80	208.0	187.3		
3123.0	20.7	81.60.2	54.2	131	97.3	87.6	181	134.5	121.1	231	171.6	154.5	281	208.7	188.0		
3223.8	21.4	82.60.9	54.9	32	98.1	88.3	82	135.2	121.8	32	172.3	155.2	82	209.5	188.7		
3324.5	22.1	83.61.7	55.5	33	98.8	89.0	83	135.9	122.4	33	173.1	155.9	83	210.2	189.3		
3425.3	22.7	84.62.4	56.2	34	99.5	89.6	84	136.7	123.1	34	173.8	156.5	84	211.0	190.0		
3526.0	23.4	85.63.1	56.9	35	100.3	90.3	85	137.4	123.8	35	174.6	157.2	85	211.7	190.7		
3626.7	24.1	86.63.9	57.5	136	101.0	91.0	186	138.2	124.4	236	175.3	157.9	286	212.5	191.3		
3727.5	24.8	87.64.6	58.2	37	101.8	91.7	87	138.9	125.1	37	176.1	158.3	87	213.2	192.0		
3828.2	25.4	88.65.4	58.9	38	102.5	92.3	88	139.7	125.8	38	176.8	159.2	88	213.9	192.7		
3929.0	26.1	89.66.1	59.5	39	103.3	93.0	89	140.4	126.4	39	177.5	159.9	89	214.7	193.3		
4029.7	26.8	90.66.9	60.2	40	104.0	93.7	90	141.1	127.1	40	178.3	160.6	90	215.4	194.0		
4130.5	27.4	91.67.6	60.9	141	104.7	94.3	191	141.9	127.8	241	179.0	161.2	291	216.2	194.7		
4231.2	28.1	92.68.3	61.5	42	105.5	95.0	92	142.6	128.4	42	179.8	161.9	92	216.9	195.3		
4331.9	28.8	93.69.1	62.2	43	106.2	95.7	93	143.4	129.1	43	180.5	162.6	93	217.7	196.0		
4432.7	29.4	94.69.8	62.9	44	107.0	96.3	94	144.1	129.8	44	181.3	163.2	94	218.4	196.7		
4533.4	30.1	95.70.6	63.6	45	107.7	97.0	95	144.9	130.5	45	182.0	163.9	95	219.1	197.4		
4634.2	30.8	96.71.3	64.2	146	108.5	97.7	196	145.6	131.1	246	182.7	164.6	296	219.9	198.0		
4734.9	31.4	97.72.1	64.9	47	109.2	98.3	97	146.3	131.8	47	183.5	165.2	97	220.6	198.7		
4835.7	32.1	98.72.8	65.6	48	109.9	99.0	98	147.1	132.5	48	184.2	165.9	98	221.4	199.4		
4936.4	32.8	99.73.5	66.2	49	110.7	99.7	99	147.8	133.1	49	185.0	166.6	99	222.1	200.0		
5037.1	33.5	100.74.3	66.9	50	111.4	100.4	200	148.6	133.8	250	185.7	167.2	300	222.9	200.7		
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

30104101

VI

for 48 Deg.



# Difference of Latitude and Departure for 43 Deg.

43

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	37.3	34.8	101	73.9	68.9	151	110.4	103.0	201	147.0	137.1	251	183.6	171.2
2	01.5	01.4	52	38.0	35.5	02	74.6	69.5	52	111.2	103.6	02	147.7	137.7	52	184.3	171.8
3	02.2	02.0	53	38.8	36.2	03	75.3	70.2	53	111.9	104.3	03	148.5	138.4	53	185.0	172.5
4	02.9	02.7	54	39.5	36.8	04	76.1	70.9	54	112.6	105.0	04	149.2	139.1	54	185.8	173.2
5	03.7	03.4	55	40.2	37.5	05	76.8	71.6	55	113.4	105.7	05	149.9	139.8	55	186.5	173.9
6	04.4	04.1	56	41.0	38.2	106	77.5	72.3	156	114.1	106.4	206	150.7	140.5	256	187.2	174.5
7	05.1	04.8	57	41.7	38.9	07	78.3	73.0	57	114.8	107.1	07	151.4	141.2	57	187.9	175.2
8	05.9	05.5	58	42.4	39.5	08	79.0	73.6	58	115.6	107.7	08	152.1	141.8	58	188.7	175.9
9	06.6	06.2	59	43.1	40.2	09	79.7	74.3	59	116.3	108.4	09	152.9	142.5	59	189.4	176.6
10	07.3	06.8	60	43.9	40.9	10	80.4	75.0	60	117.0	109.1	10	153.6	143.2	60	190.1	177.3
11	08.0	07.5	61	44.6	41.6	111	81.2	75.7	161	117.7	109.8	211	154.3	143.9	261	190.9	178.0
12	08.8	08.2	62	45.3	42.3	12	81.9	76.4	62	118.5	110.5	12	155.0	144.5	62	191.6	178.6
13	09.5	08.9	63	46.1	43.0	13	82.6	77.1	63	119.2	111.2	13	155.8	145.2	63	192.3	179.3
14	10.2	09.5	64	46.8	43.6	14	83.4	77.7	64	119.9	111.8	14	156.5	145.9	64	193.1	180.0
15	11.0	10.2	65	47.5	44.3	15	84.1	78.4	65	120.7	112.5	15	157.2	146.6	65	193.8	180.7
16	11.7	10.9	66	48.3	45.0	116	84.8	79.1	166	121.4	113.2	216	158.0	147.3	266	194.5	181.4
17	12.4	11.6	67	49.0	45.7	17	85.6	79.8	67	122.1	113.9	17	158.7	148.0	67	195.3	182.1
18	13.2	12.3	68	49.7	46.4	18	86.3	80.5	68	122.9	114.5	18	159.4	148.6	68	196.0	182.7
19	13.9	13.0	69	50.5	47.1	19	87.0	81.2	69	123.6	115.2	19	160.2	149.3	69	196.7	183.4
20	14.6	13.6	70	51.2	47.7	20	87.8	81.8	70	124.3	115.9	20	160.9	150.0	70	197.5	184.1
21	15.4	14.3	71	51.9	48.4	121	88.5	82.5	171	125.1	116.6	221	161.6	150.7	271	198.2	184.8
22	16.1	15.0	72	52.7	49.1	22	89.2	83.2	72	125.8	117.3	22	162.4	151.4	72	198.9	185.5
23	16.8	15.7	73	53.4	49.8	23	90.0	83.9	73	126.5	118.0	23	163.1	152.1	73	199.7	186.2
24	17.6	16.4	74	54.1	50.5	24	90.7	84.5	74	127.3	118.6	24	163.8	152.7	74	200.4	186.8
25	18.3	17.1	75	54.9	51.2	25	91.4	85.2	75	128.0	119.3	25	164.6	153.4	75	201.1	187.5
26	19.0	17.7	76	55.6	51.8	126	92.1	85.9	176	128.7	120.0	226	165.3	154.1	276	201.9	188.2
27	19.7	18.4	77	56.3	52.5	27	92.9	86.6	77	129.4	120.7	27	166.0	154.8	77	202.6	188.9
28	20.5	19.1	78	57.0	53.2	28	93.6	87.3	78	130.2	121.4	28	166.7	155.5	78	203.3	189.5
29	21.2	19.8	79	57.8	53.9	29	94.3	88.0	79	130.9	122.1	29	167.5	156.2	79	204.0	190.2
30	21.9	20.5	80	58.5	54.5	30	95.1	88.6	80	131.6	122.7	30	168.2	156.8	80	204.8	190.9
31	22.7	21.2	81	59.2	55.2	131	95.8	89.3	181	132.4	123.4	231	168.9	157.5	281	205.5	191.6
32	23.4	21.8	82	60.0	55.9	32	96.5	90.0	82	133.1	124.1	32	169.7	158.2	82	206.2	192.3
33	24.1	22.5	83	60.7	56.6	33	97.3	90.7	83	133.8	124.8	33	170.4	158.9	83	207.0	193.0
34	24.9	23.2	84	61.4	57.3	34	98.0	91.4	84	134.6	125.5	34	171.1	159.5	84	207.7	193.6
35	25.6	23.9	85	62.2	58.0	35	98.7	92.1	85	135.3	126.2	35	171.9	160.2	85	208.4	194.3
36	26.3	24.5	86	62.9	58.6	136	99.5	92.7	186	136.0	126.8	236	172.6	160.9	286	209.2	195.0
37	27.1	25.2	87	63.6	59.3	37	100.2	93.4	87	136.8	127.5	37	173.3	161.6	87	209.9	195.7
38	27.8	25.9	88	64.4	60.0	38	100.9	94.1	88	137.5	128.2	38	174.1	162.3	88	210.6	196.4
39	28.5	26.6	89	65.1	60.7	39	101.7	94.8	89	138.2	128.9	39	174.8	163.0	89	211.4	197.1
40	29.3	27.3	90	65.8	61.4	40	102.4	95.5	90	139.0	129.5	40	175.5	163.6	90	212.1	197.7
41	30.0	28.0	91	66.6	62.1	141	103.1	96.2	191	139.7	130.2	241	176.3	164.3	291	212.8	198.4
42	30.7	28.6	92	67.3	62.7	42	103.9	96.8	92	140.4	130.9	42	177.0	165.0	92	213.6	199.1
43	31.4	29.3	93	68.0	63.4	43	104.6	97.5	93	141.1	131.6	43	177.7	165.7	93	214.3	199.8
44	32.2	30.0	94	68.7	64.1	44	105.3	98.2	94	141.8	132.3	44	178.4	166.4	94	215.0	200.5
45	32.9	30.7	95	69.5	64.8	45	106.0	98.9	95	142.6	133.0	45	179.2	167.1	95	215.7	201.2
46	33.6	31.4	96	70.2	65.5	146	106.8	99.5	196	143.3	133.6	246	179.9	167.7	296	216.5	201.8
47	34.4	32.1	97	70.9	66.2	47	107.5	100.2	97	144.1	134.3	47	180.6	168.4	97	217.2	202.5
48	35.1	33.7	98	71.7	66.8	48	108.2	100.9	98	144.8	135.0	48	181.4	169.1	98	218.0	203.2
49	35.8	33.4	99	72.4	67.5	49	109.0	101.6	99	145.5	135.7	49	182.1	169.8	99	218.7	203.9
50	36.6	34.1	100	73.1	68.2	150	109.7	102.3	200	146.3	136.4	250	182.8	170.5	300	219.4	204.6
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 47 Deg.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	36.7	35.4	101	72.6	70.2	151	108.6	104.9	201	144.6	139.6	251	180.5	174.3
2	01.4	01.4	52	37.4	36.1	02	73.4	70.8	52	109.3	105.6	02	145.3	140.3	52	181.3	175.0
3	02.2	02.1	53	38.1	36.8	03	74.1	71.5	53	110.1	106.3	03	146.0	141.0	53	182.0	175.7
4	02.9	02.8	54	38.8	37.5	04	74.8	72.2	54	110.8	107.0	04	146.7	141.7	54	182.7	176.4
5	03.6	03.5	55	39.6	38.2	05	75.5	72.9	55	111.5	107.7	05	147.5	142.4	55	183.4	177.1
6	04.3	04.2	56	40.3	38.9	106	76.2	73.6	156	112.2	108.4	206	148.2	143.1	256	184.1	177.8
7	05.0	04.9	57	41.0	39.6	07	77.0	74.3	57	112.9	109.1	07	148.9	143.8	57	184.9	178.5
8	05.8	05.6	58	41.7	40.3	08	77.7	75.0	58	113.6	109.7	08	149.6	144.5	58	185.6	179.2
9	06.5	06.3	59	42.4	41.0	09	78.4	75.7	59	114.4	110.4	09	150.3	145.2	59	186.3	179.9
10	07.2	06.9	60	43.2	41.7	10	79.1	76.4	60	115.1	111.1	10	151.1	145.9	60	187.0	180.6
11	07.9	07.6	61	43.9	42.4	111	79.8	77.1	161	115.8	111.8	211	151.8	146.6	261	187.7	181.3
12	08.6	08.3	62	44.6	43.1	12	80.6	77.8	62	116.5	112.5	12	152.5	147.3	62	188.5	182.0
13	09.4	09.0	63	45.3	43.8	13	81.3	78.5	63	117.2	113.2	13	153.2	147.9	63	189.2	182.7
14	10.1	09.7	64	46.0	44.5	14	82.0	79.2	64	118.0	113.9	14	153.9	148.6	64	189.9	183.4
15	10.8	10.4	65	46.8	45.1	15	82.7	79.9	65	118.7	114.6	15	154.6	149.3	65	190.6	184.1
16	11.5	11.1	66	47.5	45.8	116	83.4	80.6	166	119.4	115.3	216	155.4	150.0	266	191.3	184.8
17	12.2	11.8	67	48.2	46.5	17	84.2	81.3	67	120.1	116.0	17	156.1	150.7	67	192.1	185.5
18	12.9	12.5	68	48.9	47.2	18	84.9	82.0	68	120.8	116.7	18	156.8	151.4	68	192.8	186.1
19	13.7	13.2	69	49.6	47.9	19	85.6	82.7	69	121.6	117.4	19	157.5	152.1	69	193.5	186.8
20	14.4	13.9	70	50.4	48.6	20	86.3	83.4	70	122.3	118.1	20	158.2	152.8	70	194.2	187.5
21	15.1	14.6	71	51.1	49.3	121	87.0	84.0	171	123.0	118.8	221	159.0	153.5	271	194.9	188.2
22	15.8	15.3	72	51.8	50.0	22	87.8	84.7	72	123.7	119.5	22	159.7	154.2	72	195.6	188.9
23	16.5	16.0	73	52.5	50.7	23	88.5	85.4	73	124.4	120.2	23	160.4	154.9	73	196.4	189.6
24	17.3	16.7	74	53.2	51.4	24	89.2	86.1	74	125.2	120.9	24	161.1	155.6	74	197.1	190.3
25	18.0	17.4	75	53.9	52.1	25	89.9	86.8	75	125.9	121.6	25	161.8	156.3	75	197.8	191.0
26	18.7	18.1	76	54.7	52.8	126	90.6	87.5	176	126.6	122.2	226	162.6	157.0	276	198.5	191.7
27	19.4	18.8	77	55.4	53.5	27	91.4	88.2	77	127.3	122.9	27	163.3	157.7	77	199.2	192.4
28	20.1	19.4	78	56.1	54.2	28	92.1	88.9	78	128.0	123.6	28	164.0	158.4	78	200.0	193.1
29	20.9	20.1	79	56.8	54.9	29	92.8	89.6	79	128.8	124.3	29	164.7	159.1	79	200.7	193.8
30	21.6	20.8	80	57.5	55.6	30	93.5	90.3	80	129.5	125.0	30	165.4	159.8	80	201.4	194.5
31	22.3	21.5	81	58.3	56.3	131	94.2	91.0	181	130.2	125.7	231	166.2	160.4	281	202.1	195.2
32	23.0	22.2	82	59.0	57.0	32	94.9	91.7	82	130.9	126.4	32	166.9	161.1	82	202.8	195.9
33	23.7	22.9	83	59.7	57.7	33	95.7	92.4	83	131.6	127.1	33	167.6	161.8	83	203.6	196.6
34	24.5	23.6	84	60.4	58.3	34	96.4	93.1	84	132.4	127.8	34	168.3	162.5	84	204.3	197.3
35	25.2	24.3	85	61.1	59.0	35	97.1	93.8	85	133.1	128.5	35	169.0	163.2	85	205.0	198.0
36	25.9	25.0	86	61.9	59.7	136	97.8	94.5	186	133.8	129.2	236	169.8	163.9	286	205.7	198.7
37	26.6	25.7	87	62.6	60.4	37	98.5	95.2	87	134.5	129.9	37	170.5	164.6	87	206.4	199.3
38	27.3	26.4	88	63.3	61.1	38	99.3	95.9	88	135.2	130.6	38	171.2	165.3	88	207.2	200.0
39	28.1	27.1	89	64.0	61.8	39	100.0	96.5	89	135.9	131.3	39	171.9	166.0	89	207.9	200.7
40	28.8	27.8	90	64.7	62.5	40	100.7	97.2	90	136.7	132.0	40	172.6	166.7	90	208.6	201.4
41	29.5	28.5	91	65.5	63.2	141	101.4	97.9	191	137.4	132.7	241	173.4	167.4	291	209.3	202.1
42	30.2	29.2	92	66.2	63.9	42	102.1	98.6	92	138.1	133.4	42	174.1	168.1	92	210.0	202.8
43	30.9	29.9	93	66.9	64.6	43	102.9	99.3	93	138.8	134.1	43	174.8	168.8	93	210.8	203.5
44	31.6	30.6	94	67.6	65.3	44	103.6	100.0	94	139.5	134.8	44	175.5	169.5	94	211.5	204.2
45	32.4	31.3	95	68.3	66.0	45	104.3	100.7	95	140.3	135.4	45	176.2	170.2	95	212.2	204.9
46	33.1	32.0	96	69.1	66.7	146	105.0	101.4	196	141.0	136.1	246	176.9	170.9	296	212.9	205.6
47	33.8	32.6	97	69.8	67.4	47	105.7	102.1	97	141.7	136.8	47	177.7	171.6	97	213.6	206.3
48	34.5	33.3	98	70.5	68.1	48	106.5	102.8	98	142.4	137.5	48	178.4	172.3	98	214.4	207.0
49	35.2	34.0	99	71.2	68.8	49	107.2	103.5	99	143.1	138.2	49	179.1	173.0	99	215.1	207.7
50	36.0	34.7	100	71.9	69.5	150	107.9	104.2	200	143.9	138.9	250	179.8	173.6	300	215.8	208.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat



# Difference of Latitude and Departure for 45 Deg.

45

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.7	00.7	51	36.1	36.1	101	71.4	71.4	151	106.8	106.8	201	142.1	142.1	251	177.5	177.5
2	01.4	01.4	52	36.8	36.8	102	72.1	72.1	152	107.5	107.5	202	142.8	142.8	252	178.2	178.2
3	02.1	02.1	53	37.5	37.5	103	72.8	72.8	153	108.2	108.2	203	143.5	143.5	253	178.9	178.9
4	02.8	02.8	54	38.2	38.2	104	73.5	73.5	154	108.9	108.9	204	144.2	144.2	254	179.6	179.6
5	03.5	03.5	55	38.9	38.9	105	74.2	74.2	155	109.6	109.6	205	144.9	144.9	255	180.3	180.3
6	04.2	04.2	56	39.6	39.6	106	74.9	74.9	156	110.3	110.3	206	145.7	145.7	256	181.0	181.0
7	04.9	04.9	57	40.3	40.3	107	75.7	75.7	157	111.0	111.0	207	146.4	146.4	257	181.7	181.7
8	05.7	05.7	58	41.0	41.0	108	76.4	76.4	158	111.7	111.7	208	147.1	147.1	258	182.4	182.4
9	06.4	06.4	59	41.7	41.7	109	77.1	77.1	159	112.4	112.4	209	147.8	147.8	259	183.1	183.1
10	07.1	07.1	60	42.4	42.4	110	77.8	77.8	160	113.1	113.1	210	148.5	148.5	260	183.8	183.8
11	07.8	07.8	61	43.1	43.1	111	78.5	78.5	161	113.8	113.8	211	149.2	149.2	261	184.5	184.5
12	08.5	08.5	62	43.8	43.8	112	79.2	79.2	162	114.5	114.5	212	149.9	149.9	262	185.3	185.3
13	09.2	09.2	63	44.5	44.5	113	79.9	79.9	163	115.3	115.3	213	150.6	150.6	263	186.0	186.0
14	09.9	09.9	64	45.3	45.3	114	80.6	80.6	164	116.0	116.0	214	151.3	151.3	264	186.7	186.7
15	10.6	10.6	65	46.0	46.0	115	81.3	81.3	165	116.7	116.7	215	152.0	152.0	265	187.4	187.4
16	11.3	11.3	66	46.7	46.7	116	82.0	82.0	166	117.4	117.4	216	152.7	152.7	266	188.1	188.1
17	12.0	12.0	67	47.4	47.4	117	82.7	82.7	167	118.1	118.1	217	153.4	153.4	267	188.8	188.8
18	12.7	12.7	68	48.1	48.1	118	83.4	83.4	168	118.8	118.8	218	154.1	154.1	268	189.5	189.5
19	13.4	13.4	69	48.8	48.8	119	84.1	84.1	169	119.5	119.5	219	154.8	154.8	269	190.2	190.2
20	14.1	14.1	70	49.5	49.5	120	84.8	84.8	170	120.2	120.2	220	155.6	155.6	270	190.9	190.9
21	14.8	14.8	71	50.2	50.2	121	85.6	85.6	171	120.9	120.9	221	156.3	156.3	271	191.6	191.6
22	15.6	15.6	72	50.9	50.9	122	86.3	86.3	172	121.6	121.6	222	157.0	157.0	272	192.3	192.3
23	16.3	16.3	73	51.6	51.6	123	87.0	87.0	173	122.3	122.3	223	157.7	157.7	273	193.0	193.0
24	17.0	17.0	74	52.3	52.3	124	87.7	87.7	174	123.0	123.0	224	158.4	158.4	274	193.7	193.7
25	17.7	17.7	75	53.0	53.0	125	88.4	88.4	175	123.7	123.7	225	159.1	159.1	275	194.4	194.4
26	18.4	18.4	76	53.7	53.7	126	89.1	89.1	176	124.4	124.4	226	159.8	159.8	276	195.2	195.2
27	19.1	19.1	77	54.4	54.4	127	89.8	89.8	177	125.2	125.2	227	160.5	160.5	277	195.9	195.9
28	19.8	19.8	78	55.2	55.2	128	90.5	90.5	178	125.9	125.9	228	161.2	161.2	278	196.6	196.6
29	20.5	20.5	79	55.9	55.9	129	91.2	91.2	179	126.6	126.6	229	161.9	161.9	279	197.3	197.3
30	21.2	21.2	80	56.6	56.6	130	91.9	91.9	180	127.3	127.3	230	162.6	162.6	280	198.0	198.0
31	21.9	21.9	81	57.3	57.3	131	92.6	92.6	181	128.0	128.0	231	163.3	163.3	281	198.7	198.7
32	22.6	22.6	82	58.0	58.0	132	93.3	93.3	182	128.7	128.7	232	164.0	164.0	282	199.4	199.4
33	23.3	23.3	83	58.7	58.7	133	94.0	94.0	183	129.4	129.4	233	164.7	164.7	283	200.1	200.1
34	24.0	24.0	84	59.4	59.4	134	94.7	94.7	184	130.1	130.1	234	165.5	165.5	284	200.8	200.8
35	24.7	24.7	85	60.1	60.1	135	95.5	95.5	185	130.8	130.8	235	166.2	166.2	285	201.5	201.5
36	25.5	25.5	86	60.8	60.8	136	96.2	96.2	186	131.5	131.5	236	166.9	166.9	286	202.2	202.2
37	26.2	26.2	87	61.5	61.5	137	96.9	96.9	187	132.2	132.2	237	167.6	167.6	287	202.9	202.9
38	26.9	26.9	88	62.2	62.2	138	97.6	97.6	188	132.9	132.9	238	168.3	168.3	288	203.6	203.6
39	27.6	27.6	89	62.9	62.9	139	98.3	98.3	189	133.6	133.6	239	169.0	169.0	289	204.3	204.3
40	28.3	28.3	90	63.6	63.6	140	99.0	99.0	190	134.3	134.3	240	169.7	169.7	290	205.1	205.1
41	29.0	29.0	91	64.3	64.3	141	99.7	99.7	191	135.1	135.1	241	170.4	170.4	291	205.8	205.8
42	29.7	29.7	92	65.1	65.1	142	100.4	100.4	192	135.8	135.8	242	171.1	171.1	292	206.5	206.5
43	30.4	30.4	93	65.8	65.8	143	101.1	101.1	193	136.5	136.5	243	171.8	171.8	293	207.2	207.2
44	31.1	31.1	94	66.5	66.5	144	101.8	101.8	194	137.2	137.2	244	172.5	172.5	294	207.9	207.9
45	31.8	31.8	95	67.2	67.2	145	102.5	102.5	195	137.9	137.9	245	173.2	173.2	295	208.6	208.6
46	32.5	32.5	96	67.9	67.9	146	103.2	103.2	196	138.6	138.6	246	173.9	173.9	296	209.3	209.3
47	33.2	33.2	97	68.6	68.6	147	103.9	103.9	197	139.3	139.3	247	174.6	174.6	297	210.0	210.0
48	33.9	33.9	98	69.3	69.3	148	104.6	104.6	198	140.0	140.0	248	175.4	175.4	298	210.7	210.7
49	34.6	34.6	99	70.0	70.0	149	105.4	105.4	199	140.7	140.7	249	176.1	176.1	299	211.4	211.4
50	35.4	35.4	100	70.7	70.7	150	106.1	106.1	200	141.4	141.4	250	176.8	176.8	300	212.1	212.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

O

for 45 Deg.

Numbers for the reader finding the Course in the foregoing  
Tables of Difference of Latitude and Departure.

Diff. and Diff. Lat.				Diff. and Departure.				Diff. Lat. and Dep.			
N <sup>o</sup>	Deg.	N <sup>o</sup>	Deg.	N <sup>o</sup>	Deg.	N <sup>o</sup>	Deg.	N <sup>o</sup>	Deg.	N <sup>o</sup>	Deg.
1000	1	17	89	17	1	1000	89	2	1	5882	89
999	2	35	88	35	2	999	88	3	2	2855	88
998	3	52	87	52	3	998	87	5	3	1908	87
997	4	70	86	70	4	997	86	7	4	1432	86
996	5	87	85	87	5	996	85	9	5	1145	85
995	6	105	84	105	6	995	84	10	6	950	84
993	7	122	83	122	7	993	83	12	7	816	83
990	8	139	82	139	8	990	82	14	8	711	82
988	9	156	81	156	9	988	81	16	9	622	81
985	10	173	80	173	10	985	80	18	10	568	80
982	11	191	79	191	11	982	79	19	11	515	79
978	12	208	78	208	12	978	78	21	12	470	78
974	13	225	77	225	13	974	77	23	13	433	77
970	14	242	76	242	14	970	76	25	14	401	76
966	15	259	75	259	15	966	75	27	15	373	75
961	16	276	74	276	16	961	74	29	16	349	74
956	17	292	73	292	17	956	73	30	17	328	73
951	18	309	72	309	18	951	72	32	18	308	72
945	19	326	71	326	19	945	71	34	19	290	71
940	20	342	70	342	20	940	70	36	20	275	70
934	21	358	69	358	21	934	69	38	21	260	69
927	22	375	68	375	22	927	68	40	22	248	68
921	23	391	67	391	23	921	67	42	23	236	67
914	24	407	66	407	24	914	66	45	24	225	66
906	25	423	65	423	25	906	65	47	25	214	65
899	26	438	64	438	26	899	64	49	26	205	64
891	27	454	63	454	27	891	63	51	27	196	63
883	28	470	62	470	28	883	62	53	28	188	62
875	29	485	61	485	29	875	61	55	29	180	61
866	30	500	60	500	30	866	60	58	30	173	60
857	31	515	59	515	31	857	59	60	31	166	59
848	32	530	58	530	32	848	58	62	32	160	58
839	33	545	57	545	33	839	57	65	33	154	57
829	34	559	56	559	34	829	56	67	34	148	56
819	35	574	55	574	35	819	55	70	35	143	55
809	36	588	54	588	36	809	54	73	36	138	54
799	37	602	53	602	37	799	53	75	37	133	53
788	38	616	52	616	38	788	52	78	38	128	52
777	39	629	51	629	39	777	51	81	39	123	51
766	40	643	50	643	40	766	50	84	40	119	50
755	41	656	49	656	41	755	49	87	41	115	49
743	42	669	48	669	42	743	48	90	42	111	48
731	43	682	47	682	43	731	47	93	43	107	47
719	44	695	46	695	44	719	46	96	44	103	46
707	45	707	45	707	45	707	45	100	45	100	45



## The Use of the Tables of Difference of Latitude and Departure, in working any of the Cases of Plane-Sailing.

**I**N these Tables the Course if less than 4 Points, or 45 Degrees, will be found at the Top of the Tables; but, if it is more than 4 Points, or 45 Degrees, it will be found at the Bottom of the Tables; and on every Side there are six Columns for the Distances, mark'd Dist. which contains 50 Miles in each Column, the first beginning at 1, and ending at 50; the second beginning at 51, and ending at 100, and so on to 300 Miles Distance; and to each of these Columns of Distances there belongs two other Columns, shewing the Difference of Latitude and Departure to any of them Distances, mark'd Lat. and Dep. in which you are to observe, that if your Course be found at the Top of the Tables, then you are to take the Difference of Latitude and Departure as they are mark'd at Top; but if your Course be found at Bottom, then you must take them as they are mark'd at Bottom.

*Note,* If any Case where the Course is given in Points, half Points, or Quarters, you must make use of the following Tables of Difference of Latitude and Departure, which are calculated for Points, &c. but where the Course is given in Degrees, or where it is not given at all, you must make use of the foregoing Tables of Difference of Latitude and Departure.

### PLANE SAILING.

#### Case the First.

Course and Distance being given, to find the Difference of Latitude and Departure.

#### R U L E.

Find your Course as before directed, and look in some of the Distance Columns belonging to that Course, for your Distance, the Difference of Latitude and Departure answering to that Distance, will be the Difference of Latitude and Departure required.

## E X A M P L E I.

*A Ship sails N N E. 136 Miles, I demand her Difference of Latitude and Departure.*

Having found my Course, which is 2 Points in the Table for Points, I find my Distance 136 in the third Column for Distances, and right against that, I find 125.7 Tenths for my Difference of Latitude, and 52.0 Tenths for my Departure.

*Note,* In all Cases whatsoever, if the given Side or Sides be in Miles, then the Sides found by the Table, will also be in Miles; but, if the given Side or Sides be Leagues, then the Sides found will also be Leagues.

## Plane-Sailing, Case the Second.

*Course and Difference of Latitude being given, to find the Distance and Departure.*

## R U L E.

Find your Course as before, then look in some of the Difference of Latitude Columns belonging to that Course, for your Difference of Latitude, the Distance and Departure answering to that Difference of Latitude, will be the Distance and Departure required.

## E X A M P L E.

*A Ship sails S. 48 Degrees 00 Minutes E. till her Difference of Latitude be 164 Leagues, I demand her Distance and Departure.*

Having found my Course 48 Degrees at the Bottom of the Tables, I look in some of the Columns mark'd Latitude at Bottom, for the nearest I can find to my Difference of Latitude, which is 163.9, and answering to that, I find for my Distance 245 Leagues, and for my Departure 182.0 Leagues.

## Plane-Sailing, Case the Third.

*Course and Departure being given, to find the Distance and Difference of Latitude.*

## R U L E.

Find your Course as before, then look in some of the Departure Columns belonging to that Course, for your Departure, the Distance and



and Difference of Latitude answering to that Departure, will be the Difference of Latitude required.

## E X A M P L E.

*A Ship sails SW. by S. till her Departure be 165 Miles : I demand her Distance and Difference of Latitude.*

Having found the Course, which is two Points at the Top of the Table for Points, I look in some of the Columns mark'd *Dep.* at Top, for the nearest I can find to my Departure, which is 165.0, and answering to that, I find my Distance 297 Miles, and for my Difference of Latitude 246.9 Miles.

*Note,* In any Case where the given Side is too large to be found in the Tables, then divide it by 2, 3, 4, or any other Number that will make it small enough to be found, and then the required Sides, when found, must be multiplied by the same Number ; but the Course must never be multiplied nor divided.

*Plane Sailing, Case the Fourth.*

*Distance and Difference of Latitude being given, to find the Course and Departure.*

## R U L E.

Put two Cyphers to the Difference of Latitude, and divide it by the Distance (without taking any Notice of the Comma that stands between the Miles and Tenths) and note the Quotient : Then look in the Table of Numbers (at the End of the Tables of Difference of Latitude and Departure) in the Columns belonging to Distance and Difference of Latitude, for the nearest Number to that Quotient, the Degrees answering to that Number will be the Course. Then, to find the Departure, proceed as in Case the first. But here you are to observe, that in all Cases where the Course is to be found by the Table of Numbers, the Difference of Latitude and Departure are supposed always to be in Miles and Tenths ; as for Example, 119.4 Tenths, 207.2 Tenths, &c. so that if at any Time either of them should be given in Miles without Tenths, as 117, 124, &c. you are then to put a Cypher to them, to supply the Place of Tenths, and call them 117.0 Tenths, 124.0 Tenths, &c. and then put two Cyphers more, according to your other Rles, to find the Number for the Course.

P.

EXAMPLE:

## E X A M P L E.

*A Ship sails between the North and West, till her Distance is 276 Miles, and her Difference of Latitude 211.4 Miles, I demand her Course and Departure.*

Having put two Cyphers to the Difference of Latitude, which makes it 211400, I divide it by the Distance 276, and find the Quotient to be 766 nearly; then I look in the Table of Numbers (under *Dist. and Diff. of Lat.*) for the nearest to it, which is 766, against which I find 40 Degrees for my Course, and with that Course, and my given Distance, I find my Departure to be 177.4 Miles, by Case the first.

*Plane Sailing, Case the Fifth.*

*Distance and Departure being given, to find the Course and Difference of Latitude.*

## R U L E.

Put two Cyphers to the Departure, then divide it by the Distance, and look in the Table of Numbers, in the Columns belonging to Distance and Departure, for the nearest Number to the Quotient; the Degrees answering to that Number will be the Course, and then the Difference of Latitude may be found by Case the first.

## E X A M P L E.

*A Ship sails between the South and East, till her Distance is 546 Miles, and her Departure 412 Miles, I demand her Course and Difference of Latitude.*

Having put a Cypher to my Departure, to supply the Place of Tenths, which makes it 412.0 and then two more Cyphers according to the Rule for this Case, which makes it 412000, I divide it by the Distance 546, and find the Quotient to be 754, against the nearest to which, *viz.* 755 in the Table of Numbers, under *Dist. and Dep.* I find 49 Degrees for my Course; and with that Course and my Distance (divided by 2, because it is too big to be found in the Tables) I find a Difference of Latitude 179.1 (by Case the First) which multiplied by 2, because the Distance was divided by 2, gives 358.2, for my whole Difference of Latitude.

*Plane*



*Plane Sailing, Case the Sixth.*

*Difference of Latitude and Departure being given, to find the Course and Distance.*

R U L E.

Put two Cyphers to the Departure, and divide it by the Difference of Latitude, then look in the Table of Numbers, in the Columns belonging to Difference of Latitude and Departure, for the nearest Number to the Quotient, the Degrees answering to that Number will be the Course. Then to find the Distance, proceed as in Case the Second or Third.

E X A M P L E.

*A Ship sails between the North and West, till her Difference of Latitude is 184 Miles, and her Departure 115 Miles, I demand her Course and Distance.*

Having supplied the Place of Tenths in both these Sides, which makes them 184.0, and 115.0, I then put two Cyphers to the Departure, which makes it 115000, and divide it by the Difference of Latitude 1840, and find the Quotient to be 62; against which, in the Table of Numbers, under Difference of Latitude and Departure, I find 32 Degrees for my Course, and with that Course, and my Difference of Latitude, (by Case the Second) or with that Course, and my Departure (by Case the Third) I find my Distance to be 217 Miles.

*Note,* By these foregoing Rules for *Plane Sailing*, you may work any Case in Traverse, Mercator, Parallel and Middle Latitude, only by supposing the Names of the Sides and Angles in Mercator, Parallel and Middle Latitude, to be changed into the Sides and Angles they represent in *Plane Sailing*.

T R A V E R S E S A I L I N G.

*The several Courses and Distances a Ship sails being given, to find what direct Course and Distance she has made good, and her Difference of Latitude and Departure.*

R U L E.

Make a Table as on the following Side, and set down in it your several Courses and Distances; then, by the Rule for Case the First of *Plane Sailing*, find the Difference of the Latitude and Departure to each  
of

of the Courses and Distances, and set them down in the Table opposite to the Courses they belong to, taking Notice that the Difference of Latitude must always be set in the North Column, if the Course be Northerly, and in the South Column, if the Course be Southerly; and the Departure must always be put in the East Column, if the Course be Easterly, and in the West Column, if it be Westerly.

Then add up all your Columns of North, South, East, and West separately, and set down their respective Sums at the Bottom of each Column; and if you have but one Column of Northing or Southing, and but one of Easting or Westing, then their Sums will be the Difference of Latitude and Departure of the same Name with the Column they stand under: That is, the Difference of Latitude will be Northerly, if it stands under the North Column; and the Departure Easterly, if it stands under the East Column, &c.

But if you have Numbers in all the Columns of North, South, East, and West, then take the Sums of the North and South Columns, and subtract the Less from the Greater, the Remainder will be the Difference of Latitude, of the same Name with the greater of them: Also do the same with the Sums of the East and West Columns for the Departure; then, with that Difference of Latitude and Departure, find the Course and Distance, as in Case the Sixth of *Plane Sailing*.

## E X A M P L E.

*A Ship sails the following Courses, viz. S.S.W. 54 Miles, W. by S. 39, N.W. by N. 40, N.E. by E. 69, and N.N.W. 60 Miles; I demand her direct Course, Distance, Difference of Latitude, and Departure.*

Courses	Dist.	Diff. of Lat.		Departure	
		North	South	East	West
S S W	54		49.9		20.7
W by S	39		7.6		38.2
NW by N	40	33.3			22.2
NE by E	69	38.3		57.4	
NN W	60	55.4			23.0
		127.0	57.5	57.4	104.1
		57.5			57.4
Diff. Lat	N.ly	69.5	Dep. W.erly		46.7

ing a Journal. Course N. 34.00 W. Distance 84 Miles.

*Note.* 'Tis by this Method that the Difference of Latitude and Departure are found in working any Day's Work at Sea; and from the Difference of Latitude and Departure so found, we find the Course, Distance, and Latitude by Dead-Reckoning, Meridian Distance and Longitude made; all which will be further explained in the Rules for keep-

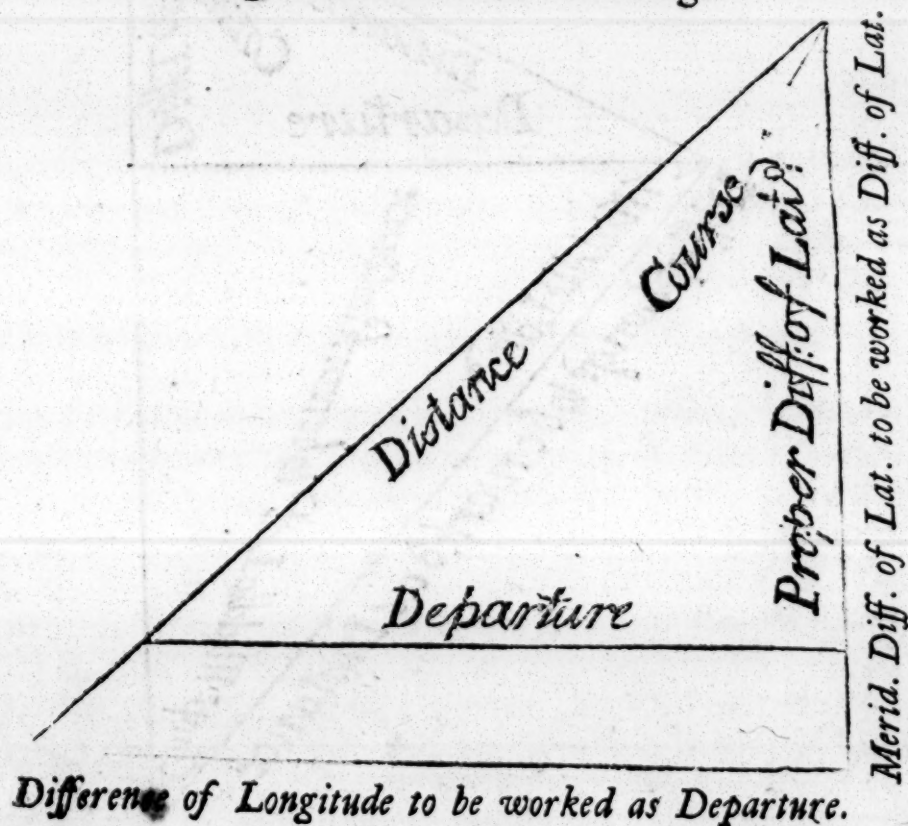


To work any Right-angled Triangle, by the foregoing Rules for  
**PLANE SAILING.**

In all Right-angled Triangles that are to be worked by the Tables, you are to suppose four Things, *viz.* Course, Distance, Difference of Latitude, and Departure, two of which must always be given to find the other two: Then, as these Rules are wrote for working of *Plane Sailing*, if you would work any other Sailing by them, as *Mercator*, *Parallel*, *Middle Latitude*, or any other Right-angled Triangle, you must suppose the Sides and Angles of that Triangle to be called by the same Name that the Sides and Angles they represent in *Plane-Sailing* are called by, and then work them as if it was a Case in *Plane-Sailing*.

As for Example. The North and South Line is any Right-angled Triangle (by whatever Name it is called in the Sailing it belongs to) must be worked as if it was a Difference of Latitude in *Plane Sailing*: The East and West Line as Departure, the long Side as Distance, and the Angle opposite to the East and West Line as Course. For Example, see the following Figures.

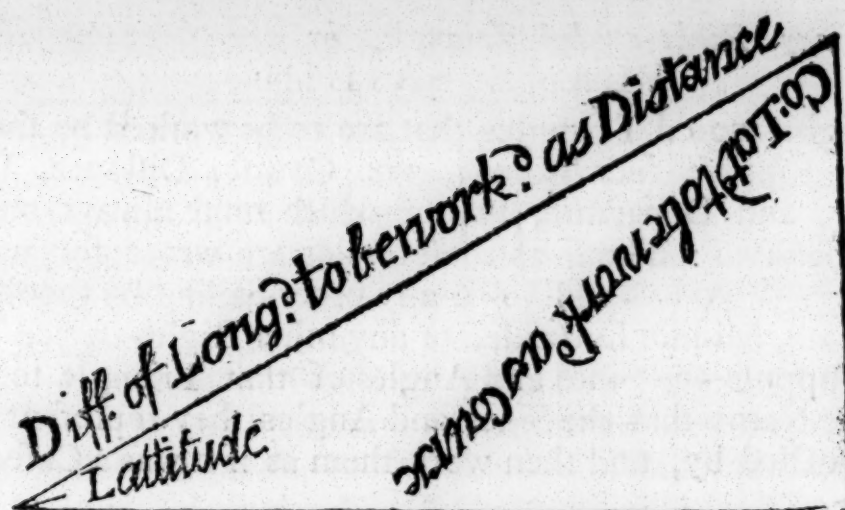
Figure for *Mercator's Sailing*.



Q

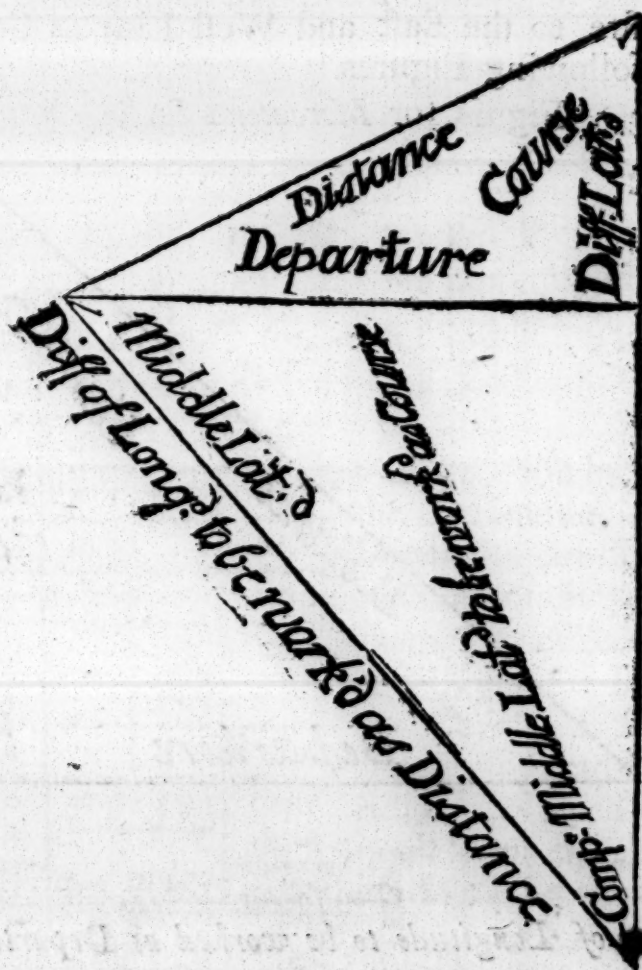
Figure

## Figure for Parallel Sailing.



Distance to be work'd as Departure.

## Figure for Middle Latitude Sailing.





## Mercator's Sailing. Case the First.

*The Latitudes and Longitudes of any two Places being given, to find what Course and Distance a Ship must sail from one Place to the other*

### R U L E.

Having the two Latitudes and two Longitudes given, find the proper Difference of Latitude, the Meridional Difference of Latitude, and the Difference of Longitude, as by the Rules for that Purpose; then, with the Meridional Difference of Latitude, and the Difference of Longitude (taken as Difference of Latitude and Departure) find the Course by the Sixth Case of *Plane Sailing*, and with that Course, and the proper Difference of Latitude, find the Distance by Case the Second of *Plane Sailing*.

### E X A M P L E.

*What Course and Distance must a Ship sail from a Place in Latitude 50.00 North, and Longitude 03.10 West, to a Place in Latitude of 17.10 North, and Longitude 59.11 West.*

Lat. sailed from—50 00 N.	}	Merid. Parts.	{	Long. sailed from 03 10 W.
Lat. bound to — 17 10 N.		3474		Long. bound — 59 11 W.
32 50 N.		1046		56 01
60		2428		60
Proper Diff. of Lat. 1970 Miles.		Mer. Diff. of Lat.		Diff. of Long. 3361 Miles.

Having put two Cyphers to the Difference of Longitude, and divided it by the Meridional Difference of Latitude, I find the Quotient to be 138, against which, in the Table of Numbers (under Difference of Latitude and Departure) I find 54 Degrees for my Course; and with that Course, and my proper Difference of Latitude, I find my Distance to be 3348 Miles.

The Course being thus found in Degrees, I want, in the next Place, to know which Quarter of the Compass it is in, that is, whether it be so many Degrees from the North towards the East, or from the North towards the West, &c. To do which, take the following Rule.

If you are to sail from a greater North Latitude to a less, or from North Latitude into South; or from a lesser South Latitude to a greater, then you must sail to the Southward.

But if you are to sail from a greater South Latitude to a less, or from South Latitude into North; or from a less North Latitude to a greater, you must sail to the Northward.

If

If you are to sail from a greater East Longitude to a less, or from a less West Longitude to a greater, or from East Longitude into West, you must sail to the Westward, except the Difference of Longitude be more than 180 Degrees, and then you must sail to the Eastward.

But if you are to go from a greater West Longitude to a less, or from a less East Longitude to a greater, or from West Longitude into East, you must sail to the Eastward, except your Difference of Longitude be more than 180 Degrees, and then you must sail to the Westward.

## E X A M P L E.

In the foregoing Case of Mercator's Sailing, I find by the two Lat. that I am bound from a greater North Latitude to a less, viz. from 50.00 N. to 17.10 N. then by the Rule I must sail to the Southward; and I find by the two Longitudes, that I am bound from a less West Longitude to a greater, viz. from 3.10 West to 59.11 West; then by that Rule I am to go to the Westward, therefore my Course will be South 54.00 West, or S.W. three quarters West nearest.

This first Case of Mercator, being the Case that is always made use of to find the Course and Distance from Place to Place, or to find the Bearing and Distance of any Place from the Ship at any Time, I have set down the Work of it at large, and shall leave the other Case for the Reader to exercise himself with, by working them by the Rules already given him.

*A Table of the Angles which every Point and Quarter Point of the Compass makes with the Meridian.*

	D	M		D	M		D	M		D	M
$\frac{1}{4}$	2	49	$2\frac{1}{4}$	25	19	$4\frac{1}{4}$	47	49	$6\frac{1}{4}$	70	19
$\frac{1}{2}$	5	37	$2\frac{1}{2}$	28	07	$4\frac{1}{2}$	50	38	$6\frac{1}{2}$	73	07
$\frac{3}{4}$	8	26	$2\frac{3}{4}$	30	56	$4\frac{3}{4}$	53	26	$6\frac{3}{4}$	75	56
1	11	15	3	38	45	5	56	15	7	78	47
$1\frac{1}{4}$	14	04	$3\frac{1}{4}$	36	34	$5\frac{1}{4}$	59	04	$7\frac{1}{4}$	81	34
$1\frac{1}{2}$	16	52	$3\frac{1}{2}$	39	22	$5\frac{1}{2}$	61	53	$7\frac{1}{2}$	84	23
$1\frac{3}{4}$	19	41	$3\frac{3}{4}$	42	11	$5\frac{3}{4}$	64	41	$7\frac{3}{4}$	87	11
2	22	30	3	45	00	6	67	30	8	90	00

The Use of this Table is to turn Points into Degrees, or Degrees into Points, as follows: Suppose I would know how many Degrees 5 Points are, then I look for 5 Points, and against it I find 56 Deg. 15 Min. Or if I would know how many Points 42 Deg. 17 Min. are, I look for the nearest to it, which is 42 Deg. 11 Min. and against that stands  $3\frac{3}{4}$  Points.

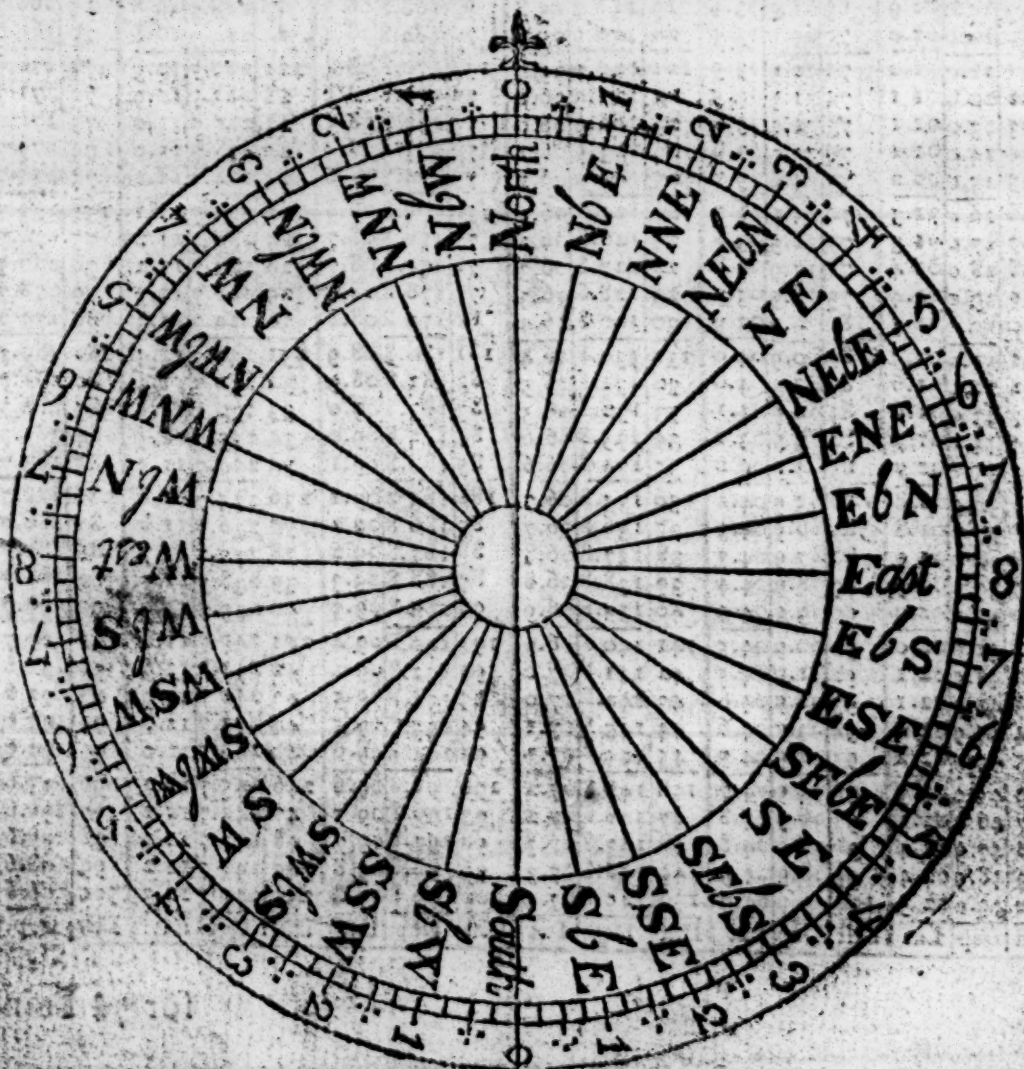


The Courses and Distances being set down in a Traverse-Table, as in Page (52) it will be found necessary for the ready looking them out in the Table of Difference of Latitude and Departure, to know what Angles they make with the Meridian, (or as we commonly say) to know how many Points there are, for which Reason I have here given the Figure of the Mariner's Compass, which is to be used as follows.

*Example 1st.* Suppose I would know how many Points I must look out for in the Tables of Difference of Latitude and Departure, for a SW. by W. Course.

Look in the Figure below, against the Point mark'd with S W. by W. you will see the Figure 5, which shews that you must look out for 5 Points.

*Example 2d.* How many Points is E. by N.  $\frac{1}{4}$  E. against E. by N. I find 7, and my Course being  $\frac{1}{4}$  Point more, it makes 7  $\frac{1}{4}$ .



Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.0	51	50.9	02.5	101	100.9	05.0	151	150.8	07.4	201	200.8	09.9	251	250.7	12.3
2	02.0	00.1	52	51.9	02.6	02	101.9	05.0	52	151.8	07.5	02	201.8	09.9	52	251.7	12.4
3	03.0	00.1	53	52.9	02.6	03	102.9	05.1	53	152.8	07.5	03	202.8	10.0	53	252.7	12.4
4	04.0	00.2	54	53.9	02.7	04	103.9	05.1	54	153.8	07.6	24	203.8	10.0	54	253.7	12.5
5	05.0	00.2	55	54.9	02.7	05	104.9	05.2	55	154.8	07.6	05	204.8	10.1	55	254.7	12.5
6	06.0	00.3	56	55.9	02.7	106	105.9	05.2	156	155.8	07.7	206	205.8	10.1	256	255.7	12.6
7	07.0	00.3	57	56.9	02.8	07	106.9	05.3	57	156.8	07.7	07	206.8	10.2	57	256.7	12.6
8	08.0	00.4	58	57.9	02.8	08	107.9	05.3	58	157.8	07.8	08	207.8	10.2	58	257.7	12.7
9	09.0	00.4	59	58.9	02.9	09	108.9	05.4	59	158.8	07.8	09	208.7	10.3	59	258.7	12.7
10	10.0	00.5	60	59.9	02.9	10	109.9	05.4	60	159.8	07.9	10	209.7	10.3	60	259.7	12.8
11	11.0	00.5	61	60.9	03.0	111	110.9	05.5	161	160.8	07.9	211	210.7	10.4	261	260.7	12.8
12	12.0	00.6	62	61.9	03.0	12	111.9	05.5	62	161.8	08.0	12	211.7	10.4	62	261.7	12.9
13	13.0	00.6	63	62.9	03.1	13	112.9	05.5	63	162.8	08.0	13	212.7	10.5	63	262.7	12.9
14	14.0	00.7	64	63.9	03.1	14	113.9	05.6	64	163.8	08.1	14	213.7	10.5	64	263.7	13.0
15	15.0	00.7	65	64.9	03.2	15	114.9	05.6	65	164.8	08.1	15	214.7	10.6	65	264.7	13.0
16	16.0	00.8	66	65.9	03.2	116	115.9	05.7	66	165.8	08.2	216	215.7	10.6	266	265.7	13.1
17	17.0	00.8	67	66.9	03.3	17	116.9	05.7	67	166.8	08.2	17	216.7	10.7	67	266.7	13.1
18	18.0	00.9	68	67.9	03.3	18	117.9	05.8	68	167.8	08.3	18	217.7	10.7	68	267.7	13.2
19	19.0	00.9	69	68.9	03.4	19	118.9	05.8	69	168.8	08.3	19	218.7	10.8	69	268.7	13.2
20	20.0	01.0	70	69.9	03.4	20	119.9	05.9	70	169.8	08.4	20	219.7	10.8	70	269.7	13.3
21	21.0	01.0	71	70.9	03.5	121	120.9	05.9	171	170.8	08.4	221	220.7	10.9	271	270.7	13.3
22	22.0	01.1	72	71.9	03.5	22	121.9	06.0	72	171.8	08.5	22	221.7	10.9	72	271.7	13.4
23	23.0	01.1	73	72.9	03.6	23	122.9	06.0	73	172.8	08.5	23	222.7	11.0	73	272.7	13.4
24	24.0	01.2	74	73.9	03.6	24	123.9	06.1	74	173.8	08.5	24	223.7	11.0	74	273.7	13.5
25	25.0	01.2	75	74.9	03.7	25	124.9	06.1	75	174.8	08.6	25	224.7	11.1	75	274.7	13.5
26	26.0	01.3	76	75.9	03.7	126	125.8	06.2	176	175.8	08.6	226	225.7	11.1	276	275.7	13.6
27	27.0	01.3	77	76.9	03.8	27	126.8	06.2	77	176.8	08.7	27	226.7	11.2	77	276.7	13.6
28	28.0	01.4	78	77.9	03.8	28	127.8	06.3	78	177.8	08.7	28	227.7	11.2	78	277.7	13.7
29	29.0	01.4	79	78.9	03.9	29	128.8	06.3	79	178.8	08.8	29	228.7	11.3	79	278.7	13.7
30	30.0	01.5	80	79.9	03.9	30	129.8	06.4	80	179.8	08.8	30	229.7	11.3	80	279.7	13.8
31	31.0	01.5	81	80.9	04.0	131	130.8	06.4	181	180.8	08.9	231	230.7	11.4	281	280.7	13.8
32	32.0	01.6	82	81.9	04.0	32	131.8	06.5	82	181.8	08.9	32	231.7	11.4	82	281.7	13.9
33	33.0	01.6	83	82.9	04.1	33	132.8	06.5	83	182.8	09.0	33	232.7	11.5	83	282.7	13.9
34	34.0	01.7	84	83.9	04.1	34	133.8	06.6	84	183.8	09.0	34	233.7	11.5	84	283.7	14.0
35	35.0	01.7	85	84.9	04.2	35	134.8	06.6	85	184.8	09.1	35	234.7	11.5	85	284.7	14.0
36	36.0	01.8	86	85.9	04.2	136	135.8	06.7	186	185.8	09.1	236	235.7	11.6	286	285.7	14.1
37	37.0	01.8	87	86.9	04.3	37	136.8	06.7	87	186.8	09.2	37	236.7	11.6	87	286.7	14.1
38	38.0	01.9	88	87.9	04.3	38	137.8	06.8	88	187.8	09.2	38	237.7	11.7	88	287.7	14.2
39	39.0	01.9	89	88.9	04.4	39	138.8	06.8	89	188.8	09.3	39	238.7	11.7	89	288.7	14.2
40	40.0	02.0	90	89.9	04.4	40	139.8	06.9	90	189.8	09.3	40	239.7	11.8	90	289.7	14.3
41	41.0	02.0	91	90.9	04.5	141	140.8	06.9	191	190.8	09.4	241	240.7	11.8	291	290.7	14.3
42	42.0	02.1	92	91.9	04.5	42	141.8	07.0	92	191.8	09.4	42	241.7	11.9	92	291.6	14.4
43	43.0	02.1	93	92.9	04.6	43	142.8	07.0	93	192.8	09.5	43	242.7	11.9	93	292.6	14.4
44	44.0	02.2	94	93.9	04.6	44	143.8	07.1	94	193.8	09.5	44	243.7	12.0	94	293.6	14.5
45	45.0	02.2	95	94.9	04.7	45	144.8	07.1	95	194.8	09.6	45	244.7	12.0	95	294.6	14.5
46	46.0	02.3	96	95.9	04.7	146	145.8	07.2	196	195.8	09.6	246	245.7	12.1	296	295.6	14.5
47	47.0	02.3	97	96.9	04.8	47	146.8	07.2	97	196.8	09.7	47	246.7	12.1	97	296.6	14.6
48	48.0	02.4	98	97.9	04.8	48	147.8	07.3	98	197.8	09.7	48	247.7	12.2	98	297.6	14.6
49	49.0	02.4	99	98.9	04.9	49	148.8	07.3	99	198.8	09.8	49	248.7	12.2	99	298.6	14.7
50	49.9	02.5	100	99.9	04.9	150	149.8	07.4	200	199.8	09.8	250	249.7	12.3	300	299.6	14.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $7\frac{1}{4}$  Points.



# Difference of Latitude and Departure for $\frac{1}{2}$ Points.

59

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.8	05.0	101	100.5	09.9	151	150.3	14.8	201	200.0	19.7	251	249.8	24.6
2	02.0	00.2	52	51.8	05.1	02	101.5	10.0	52	151.3	14.9	02	201.0	19.8	52	250.8	24.7
3	03.0	00.3	53	52.7	05.2	03	102.5	10.1	53	152.3	15.0	03	202.0	19.9	53	251.8	24.8
4	04.0	00.4	54	53.7	05.3	04	103.5	10.2	54	153.3	15.1	04	203.0	20.0	54	252.8	24.9
5	05.0	00.5	55	54.7	05.4	05	104.5	10.3	55	154.3	15.2	05	204.0	20.1	55	253.8	25.0
6	06.0	00.6	56	55.7	05.5	106	105.5	10.4	156	155.3	15.3	206	205.0	20.2	256	254.8	25.1
7	07.0	00.7	57	56.7	05.6	07	106.5	10.5	57	156.2	15.4	07	206.0	20.2	57	255.8	25.2
8	08.0	00.8	58	57.7	05.7	08	107.5	10.6	58	157.2	15.5	08	207.0	20.3	58	256.8	25.3
9	09.0	00.9	59	58.7	05.8	09	108.5	10.7	59	158.2	15.6	09	208.0	20.4	59	257.8	25.4
10	10.0	01.0	60	59.7	05.9	10	109.5	10.8	60	159.2	15.7	10	209.0	20.5	60	258.8	25.5
11	10.9	01.1	61	60.7	06.0	111	110.5	10.9	161	160.2	15.7	211	210.0	20.6	261	259.7	25.6
12	11.9	01.2	62	61.7	06.1	12	111.5	11.0	62	161.2	15.8	12	211.0	20.7	62	260.7	25.7
13	12.9	01.3	63	62.7	06.2	13	112.5	11.1	63	162.2	15.9	13	212.0	20.8	63	261.7	25.8
14	13.9	01.4	64	63.7	06.3	14	113.5	11.2	64	163.2	16.0	14	213.0	20.9	64	262.7	25.9
15	14.9	01.5	65	64.7	06.4	15	114.4	11.2	65	164.2	16.1	15	214.0	21.0	65	263.7	26.0
16	15.9	01.6	66	65.7	06.5	116	115.4	11.3	166	165.2	16.2	216	215.0	21.1	266	264.7	26.1
17	16.9	01.7	67	66.7	06.6	17	116.4	11.4	67	166.2	16.3	17	216.0	21.2	67	265.7	26.2
18	17.9	01.8	68	67.7	06.7	18	117.4	11.5	68	167.2	16.4	18	217.0	21.3	68	266.7	26.3
19	18.9	01.9	69	68.7	06.7	19	118.4	11.6	69	168.2	16.5	19	217.0	21.4	69	267.7	26.4
20	19.9	02.0	70	69.7	06.8	20	119.4	11.7	70	169.2	16.6	20	218.0	21.5	70	268.7	26.5
21	20.9	02.1	71	70.7	06.9	121	120.4	11.8	171	170.2	16.7	221	219.0	21.6	271	269.7	26.6
22	21.9	02.2	72	71.7	07.0	22	121.4	11.9	72	171.2	16.8	22	220.0	21.7	72	270.7	26.7
23	22.9	02.2	73	72.6	07.1	23	122.4	12.0	73	172.2	16.9	23	221.0	21.8	73	271.7	26.8
24	23.9	02.3	74	73.6	07.2	24	123.4	12.1	74	173.2	17.0	24	222.0	22.0	74	272.7	26.9
25	24.9	02.4	75	74.6	07.3	25	124.4	12.2	75	174.2	17.1	25	223.0	22.0	75	273.7	27.0
26	25.9	02.5	76	75.6	07.4	126	125.4	12.3	176	175.2	17.2	226	224.0	22.1	276	274.7	27.1
27	26.9	02.6	77	76.6	07.5	27	126.4	12.4	77	176.2	17.3	27	225.0	22.2	77	275.7	27.2
28	27.9	02.7	78	77.6	07.6	28	127.4	12.5	78	177.1	17.4	28	226.0	22.3	78	276.7	27.3
29	28.9	02.8	79	78.6	07.7	29	128.4	12.6	79	178.1	17.5	29	227.0	22.4	79	277.7	27.4
30	29.9	02.9	80	79.6	07.8	30	129.4	12.7	80	179.1	17.6	30	228.0	22.5	80	278.7	27.5
31	30.9	03.0	81	80.6	07.9	131	130.4	12.8	181	180.1	17.7	231	229.0	22.6	281	279.6	27.6
32	31.8	03.1	82	81.6	08.0	32	131.4	12.9	82	181.1	17.8	32	230.0	22.7	82	280.6	27.7
33	32.8	03.2	83	82.6	08.1	33	132.4	13.0	83	182.1	17.9	33	231.0	22.8	83	281.6	27.8
34	33.8	03.3	84	83.6	08.2	34	133.4	13.1	84	183.1	18.0	34	232.0	22.9	84	282.6	27.9
35	34.8	03.4	85	84.6	08.3	35	134.4	13.2	85	184.1	18.1	35	233.0	23.0	85	283.6	28.0
36	35.8	03.5	86	85.6	08.4	136	135.3	13.3	186	185.1	18.2	236	234.0	23.1	286	284.6	28.1
37	36.8	03.6	87	86.6	08.5	37	136.3	13.4	87	186.1	18.3	37	235.0	23.2	87	285.6	28.2
38	37.8	03.7	88	87.6	08.6	38	137.3	13.5	88	187.1	18.4	38	236.0	23.3	88	286.6	28.3
39	38.8	03.8	89	88.6	08.7	39	138.3	13.6	89	188.1	18.5	39	237.0	23.4	89	287.6	28.4
40	39.8	03.9	90	89.6	08.8	40	139.3	13.7	90	189.1	18.6	40	238.0	23.5	90	288.6	28.5
41	40.8	04.0	91	90.6	08.9	141	140.3	13.8	191	190.1	18.7	241	239.0	23.6	291	289.6	28.6
42	41.8	04.1	92	91.6	09.0	42	141.3	13.9	92	191.1	18.8	42	240.0	23.7	92	290.6	28.7
43	42.8	04.2	93	92.6	09.1	43	142.3	14.0	93	192.1	18.9	43	241.0	23.8	93	291.6	28.8
44	43.8	04.3	94	93.5	09.2	44	143.3	14.1	94	193.1	19.0	44	242.0	23.9	94	292.6	28.9
45	44.8	04.4	95	94.5	09.3	45	144.3	14.2	95	194.1	19.1	45	243.0	24.0	95	293.6	29.0
46	45.8	04.5	96	95.5	09.4	146	145.3	14.3	196	195.1	19.2	246	244.0	24.1	296	294.6	29.1
47	46.8	04.6	97	96.5	09.5	47	146.3	14.4	97	196.1	19.3	47	245.0	24.2	97	295.6	29.2
48	47.8	04.7	98	97.5	09.6	48	147.3	14.5	98	197.0	19.4	48	246.0	24.3	98	296.6	29.2
49	48.8	04.8	99	98.5	09.7	49	148.3	14.6	99	198.0	19.5	49	247.0	24.4	99	297.6	29.3
50	49.8	04.9	100	99.5	09.8	50	149.3	14.7	200	199.0	19.6	50	248.0	24.5	300	298.6	29.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $7 \frac{1}{2}$  Points.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.1	51	50.4	07.5	101	99.9	14.8	151	149.4	22.1	201	198.8	29.5	251	248.3	36.8
2	02.0	00.3	52	51.4	07.6	02	100.9	15.0	52	150.3	22.3	02	199.8	29.6	52	249.3	37.0
3	03.0	00.4	53	52.4	07.8	03	101.9	15.1	53	151.3	22.4	03	200.8	29.8	53	250.2	37.1
4	04.0	00.6	54	53.4	07.9	04	102.9	15.3	54	152.3	22.6	04	201.8	29.9	54	251.2	37.3
5	04.9	00.7	55	54.4	08.1	05	103.9	15.4	55	153.3	22.7	05	202.8	30.1	55	252.2	37.4
6	05.9	00.9	56	55.4	08.2	106	104.8	15.5	156	154.3	22.9	206	203.8	30.2	256	253.2	37.5
7	06.9	01.0	57	56.4	08.4	07	105.8	15.7	57	155.3	23.0	07	204.7	30.4	57	254.2	37.7
8	07.9	01.2	58	57.4	08.5	08	106.8	15.8	58	156.3	23.2	08	205.7	30.5	58	255.2	37.8
9	08.9	01.3	59	58.4	08.6	09	107.8	16.0	59	157.3	23.3	09	206.7	30.6	59	256.2	38.0
10	09.9	01.5	60	59.3	08.8	10	108.8	16.1	60	158.3	23.5	10	207.7	30.8	60	257.2	38.1
11	10.9	01.6	61	60.3	08.9	111	109.8	16.3	161	159.2	23.6	211	208.7	30.9	261	258.2	38.3
12	11.9	01.8	62	61.3	09.1	12	110.8	16.4	62	160.2	23.8	12	209.7	31.1	62	259.1	38.4
13	12.9	01.9	63	62.3	09.2	13	111.8	16.6	63	161.2	23.9	13	210.7	31.2	63	260.1	38.6
14	13.8	02.1	64	63.3	09.4	14	112.8	16.7	64	162.2	24.0	14	211.7	31.4	64	261.1	38.7
15	4.8	02.2	65	64.3	09.5	15	113.7	16.9	65	163.2	24.2	15	212.7	31.5	65	262.1	38.9
16	15.8	02.3	66	65.3	09.7	116	114.7	17.0	166	164.2	24.3	216	213.7	31.7	266	263.1	39.0
17	16.8	02.5	67	66.3	09.8	17	115.7	17.2	67	165.2	24.5	17	214.6	31.8	67	264.1	39.2
18	17.8	02.6	68	67.3	10.0	18	116.7	17.3	68	166.2	24.6	18	215.6	32.0	68	265.1	39.3
19	18.8	02.8	69	68.2	10.1	19	117.7	17.5	69	167.2	24.8	19	216.6	32.1	69	266.1	39.5
20	19.8	02.9	70	69.2	10.3	20	118.7	17.6	70	168.1	24.9	20	217.6	32.3	70	267.1	39.6
21	20.8	03.1	71	70.2	10.4	121	119.7	17.7	171	169.1	25.1	221	218.6	32.4	271	268.1	39.7
22	21.8	03.2	72	71.2	10.6	22	120.7	17.9	72	170.1	25.2	22	219.6	32.6	72	269.0	39.9
23	22.7	03.4	73	72.2	10.7	23	121.7	18.0	73	171.1	25.4	23	220.6	32.7	73	270.0	40.0
24	23.7	03.5	74	73.2	10.8	24	122.7	18.2	74	172.1	25.5	24	221.6	32.8	74	271.0	40.2
25	24.7	03.7	75	74.2	11.0	25	123.6	18.3	75	173.1	25.7	25	222.6	33.0	75	272.0	40.3
26	25.7	03.8	76	75.2	11.1	126	124.6	18.5	176	174.1	25.8	226	223.5	33.1	276	273.0	40.5
27	26.7	04.0	77	76.2	11.2	27	125.6	18.6	77	175.1	26.0	27	224.5	33.3	77	274.0	40.6
28	27.7	04.1	78	77.1	11.4	28	126.6	18.8	78	176.1	26.1	28	225.5	33.4	78	275.0	40.8
29	28.7	04.3	79	78.1	11.6	29	127.6	18.9	79	177.1	26.3	29	226.5	33.6	79	276.0	40.9
30	29.7	04.4	80	79.1	11.7	30	128.6	19.1	80	178.0	26.4	30	227.5	33.7	80	277.0	41.1
31	30.7	04.5	81	80.1	11.9	131	129.6	19.2	181	179.0	26.5	231	228.5	33.9	281	277.9	41.2
32	31.7	04.7	82	81.1	12.0	32	130.6	19.4	82	180.0	26.7	32	229.5	34.0	82	278.9	41.4
33	32.6	04.8	83	82.1	12.2	33	131.6	19.5	83	181.0	26.8	33	230.5	34.2	83	279.9	41.5
34	33.6	05.0	84	83.1	12.3	34	132.5	19.6	84	182.0	27.0	34	231.5	34.3	84	280.9	41.6
35	34.6	05.1	85	84.1	12.5	35	133.5	19.8	85	183.0	27.1	35	232.4	34.5	85	281.9	41.8
36	35.6	05.3	86	85.1	12.6	136	134.5	19.9	186	184.0	27.3	236	233.4	34.6	286	282.9	41.9
37	36.6	05.4	87	86.1	12.8	37	135.5	20.1	87	185.0	27.4	37	234.4	34.8	87	283.9	42.1
38	37.6	05.6	88	87.0	12.9	38	136.5	20.2	88	186.0	27.6	38	235.4	34.9	88	284.9	42.2
39	38.6	05.7	89	88.0	13.0	39	137.5	20.4	89	186.9	27.7	39	236.4	35.0	89	285.9	42.4
40	39.6	05.9	90	89.0	13.2	40	138.5	20.5	90	187.9	27.9	40	237.4	35.2	90	286.8	42.5
41	40.6	06.0	91	90.0	13.3	141	139.5	20.7	191	188.9	28.0	241	238.4	35.3	291	287.8	42.7
42	41.5	06.2	92	91.0	13.5	42	140.5	20.8	92	189.9	28.2	42	239.4	35.5	92	288.8	42.8
43	42.5	06.3	93	92.0	13.6	43	141.4	21.0	93	190.9	28.3	43	240.4	35.6	93	289.8	43.0
44	43.5	06.5	94	93.0	13.8	44	142.4	21.1	94	191.9	28.5	44	241.3	35.8	94	290.8	43.1
45	44.5	06.6	95	94.0	13.9	45	143.4	21.3	95	192.9	28.6	45	242.3	35.9	95	291.8	43.3
46	45.5	06.7	96	95.0	14.1	146	144.4	21.4	196	193.9	28.7	246	243.3	36.1	296	292.8	43.4
47	46.5	06.9	97	95.9	14.2	47	145.4	21.6	97	194.9	28.9	47	244.3	36.2	97	293.8	43.6
48	47.5	07.0	98	96.9	14.4	48	146.4	21.7	98	195.8	29.0	48	245.3	36.4	98	294.8	43.7
49	48.5	07.2	99	97.9	14.5	49	147.4	21.8	99	196.8	29.2	49	246.3	36.5	99	295.7	43.8
50	49.5	07.3	100	98.9	14.7	150	148.4	22.0	200	197.8	29.3	50	247.3	36.7	300	296.7	44.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 7  $\frac{1}{4}$  Points.



# Difference of Latitude and Departure for 1 Point.

61

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	01.000.2		51	50.0	10.0	101	99.1	19.7	151	148.1	29.5	201	197.1	39.2	251	246.1	49.0
2	02.000.4		52	51.0	10.1	02	100.0	19.9	52	149.1	29.7	02	198.1	39.4	52	247.1	49.2
3	02.900.6		53	52.0	10.3	03	101.0	20.1	53	150.0	29.9	03	199.1	39.6	53	248.1	49.4
4	03.900.8		54	53.0	10.5	04	102.0	20.3	54	151.0	30.0	04	200.1	39.8	54	249.1	49.6
5	04.901.0		55	53.9	10.7	05	103.0	20.5	55	152.0	30.2	05	201.0	40.0	55	250.1	49.8
6	05.901.2		56	54.9	10.9	106	104.0	20.7	156	153.0	30.4	206	202.0	40.2	256	251.1	50.0
7	06.901.4		57	55.9	11.1	07	104.9	20.9	57	154.0	30.9	07	203.0	40.4	57	252.0	50.1
8	07.801.6		58	56.9	11.3	08	105.9	21.1	58	154.9	30.8	08	204.0	40.6	58	253.0	50.3
9	08.801.8		59	57.9	11.5	09	106.9	21.3	59	155.9	31.0	09	205.0	40.8	59	254.0	50.5
10	09.802.0		60	58.8	11.7	10	107.9	21.5	60	156.9	31.2	10	205.9	41.0	60	255.0	50.7
11	10.802.1		61	59.8	11.9	111	108.9	21.7	161	157.9	31.4	211	206.9	41.2	261	256.0	50.9
12	11.802.3		62	60.8	12.1	12	109.8	21.9	62	158.9	31.6	12	207.9	41.4	62	256.9	51.1
13	12.702.5		63	61.8	12.3	13	110.8	22.0	63	159.8	31.8	13	208.9	41.6	63	257.9	51.3
14	13.702.7		64	62.8	12.5	14	111.8	22.2	64	160.8	32.0	14	209.9	41.8	64	258.9	51.5
15	14.702.9		65	63.7	12.7	15	112.8	22.4	65	161.8	32.2	15	210.8	42.0	65	259.9	51.7
16	15.703.1		66	64.7	12.9	116	113.8	22.6	166	162.8	32.4	216	211.8	42.1	266	260.9	41.9
17	16.703.3		67	65.7	13.1	17	114.7	22.8	67	163.8	32.6	17	212.8	42.3	67	261.8	52.1
18	17.703.5		68	66.7	13.3	18	115.7	23.0	68	164.7	32.8	18	213.8	42.5	68	262.8	52.3
19	18.603.7		69	67.7	13.5	19	116.7	23.2	69	165.7	33.0	19	214.8	42.7	69	263.8	52.5
20	19.603.9		70	68.6	13.7	20	117.7	23.4	70	166.7	33.2	20	215.7	42.9	70	264.8	52.7
21	20.604.1		71	69.6	13.9	121	118.7	23.6	171	167.7	33.4	221	216.7	43.1	271	265.8	52.9
22	21.604.3		72	70.6	14.0	22	119.6	23.8	72	168.7	33.6	22	217.7	43.3	72	266.7	53.1
23	22.604.5		73	71.6	14.2	23	120.6	24.0	73	169.7	33.8	23	218.7	43.5	73	267.7	53.3
24	23.504.7		74	72.6	14.4	24	121.6	24.2	74	170.6	34.0	24	219.7	43.7	74	268.7	53.5
25	24.504.9		75	73.6	14.6	25	122.6	24.4	75	171.6	34.1	25	220.6	43.9	75	269.7	53.7
26	25.505.1		76	74.5	14.8	126	123.6	24.6	176	172.6	34.3	226	221.6	44.1	276	270.7	53.9
27	26.505.3		77	75.5	15.0	27	124.5	24.8	77	173.6	34.5	27	222.6	44.3	77	271.6	54.0
28	27.505.5		78	76.5	15.2	28	125.5	25.0	78	174.6	34.7	28	223.6	44.5	78	272.6	54.2
29	28.405.7		79	77.5	15.4	29	126.5	25.2	79	175.5	34.9	29	224.6	44.7	79	273.6	54.4
30	29.405.9		80	78.5	15.6	30	127.5	25.4	80	176.5	35.1	30	225.6	44.9	80	274.6	54.6
31	30.406.0		81	79.4	15.8	131	128.5	25.6	181	177.5	35.3	231	226.5	45.1	281	275.6	54.8
32	31.406.2		82	80.4	16.0	32	129.5	25.8	82	178.5	35.5	32	227.5	45.3	82	276.5	55.0
33	32.406.4		83	81.4	16.2	33	130.4	26.0	83	179.5	35.7	33	228.5	45.5	83	277.5	55.2
34	33.306.6		84	82.4	16.4	34	131.4	26.1	84	180.4	35.9	34	229.5	45.7	84	278.5	55.4
35	34.306.8		85	83.4	16.6	35	132.4	26.3	85	181.4	36.1	35	230.5	45.9	85	279.5	55.6
36	35.307.0		86	84.3	16.8	136	133.4	26.5	186	182.4	36.3	236	231.4	46.0	286	280.5	55.8
37	36.307.2		87	85.3	17.0	37	134.4	26.7	87	183.4	36.5	37	232.4	46.2	87	281.5	56.0
38	37.307.4		88	86.3	17.2	38	135.3	26.9	88	184.4	36.7	38	233.4	46.4	88	282.4	56.2
39	38.207.6		89	87.3	17.4	39	136.3	27.1	89	185.3	36.9	39	234.4	46.6	89	283.4	56.4
40	39.207.8		90	88.3	17.6	40	137.3	27.3	90	186.3	37.1	40	235.4	46.8	90	284.4	56.6
41	40.208.0		91	89.2	17.8	141	138.3	27.5	191	187.3	37.3	241	236.3	47.0	291	285.4	56.8
42	41.208.2		92	90.2	18.0	42	139.3	27.7	92	188.3	37.5	42	237.3	47.2	92	286.4	57.0
43	42.208.4		93	91.2	18.1	43	140.2	27.9	93	189.3	37.7	43	238.3	47.4	93	287.3	57.2
44	43.208.6		94	92.2	18.3	44	141.2	28.1	94	190.2	37.9	44	239.3	47.6	94	288.3	57.4
45	44.108.8		95	93.2	18.5	45	142.2	28.3	95	191.2	38.0	45	240.3	47.8	95	289.3	57.6
46	45.109.0		96	94.1	18.7	146	143.2	28.5	196	192.2	38.2	246	241.2	48.0	296	290.3	57.8
47	46.109.2		97	95.1	18.9	47	144.2	28.7	97	193.2	38.4	47	242.2	48.2	97	291.3	58.0
48	47.109.4		98	96.1	19.1	48	145.1	28.9	98	194.2	38.6	48	243.2	48.4	98	292.2	58.1
49	48.109.6		99	97.1	19.3	49	146.1	29.1	99	195.2	38.8	49	244.2	48.6	99	293.2	58.3
50	49.009.8		100	98.1	19.5	150	147.1	29.3	200	196.1	39.0	250	245.2	48.8	300	294.2	58.5
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

S

for 7 Points.

62 Difference of Latitude and Departure for  $1\frac{1}{4}$  Point.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.2	51	49.5	12.4	101	98.0	24.5	151	146.5	36.7	201	195.0	48.8	251	243.5	61.0
2	01.9	00.5	52	50.4	12.6	02	98.9	24.8	52	147.4	36.9	02	195.9	49.1	52	244.4	61.2
3	02.9	00.7	53	51.4	12.9	03	99.9	25.0	53	148.4	37.2	03	196.9	49.3	53	245.4	61.5
4	03.9	01.0	54	52.4	13.1	04	100.9	25.3	54	149.4	37.4	04	197.9	49.6	54	246.4	61.7
5	04.9	01.2	55	53.4	13.4	05	101.9	25.5	55	150.4	37.7	05	198.9	49.8	55	247.4	62.0
6	05.8	01.5	56	54.3	13.6	106	102.8	25.8	156	151.3	37.9	206	199.8	50.1	256	248.3	62.2
7	06.8	01.7	57	55.3	13.9	07	103.8	26.0	57	152.3	38.2	07	200.8	50.3	57	249.3	62.5
8	07.8	01.9	58	56.3	14.1	08	104.8	26.2	58	153.3	38.4	08	201.8	50.5	58	250.3	62.7
9	08.7	02.1	59	57.2	14.3	09	105.7	26.5	59	154.2	38.6	09	202.7	50.8	59	251.2	62.9
10	09.7	02.4	60	58.2	14.6	10	106.7	26.7	60	155.2	38.9	10	203.7	51.0	60	252.2	63.2
11	10.7	02.7	61	59.2	14.8	111	107.7	27.0	161	156.2	39.1	211	204.7	51.3	261	253.2	63.4
12	11.6	02.9	62	60.1	15.1	12	108.6	27.2	62	157.1	39.4	12	205.6	51.5	62	254.1	63.7
13	12.6	03.2	63	61.1	15.3	13	109.6	27.5	63	158.1	39.6	13	206.6	51.8	63	255.1	63.9
14	13.6	03.4	64	62.1	15.6	14	110.6	27.7	64	159.1	39.9	14	207.6	52.0	64	256.1	64.2
15	14.6	03.6	65	63.1	15.8	15	111.6	27.9	65	160.1	40.1	15	208.6	52.2	65	257.1	64.4
16	15.5	03.9	66	64.0	16.0	116	112.5	28.2	166	161.0	40.3	216	209.5	52.5	266	258.0	64.6
17	16.5	04.1	67	65.0	16.3	17	113.5	28.4	67	162.0	40.6	17	210.5	52.7	67	259.0	64.9
18	17.5	04.4	68	66.0	16.5	18	114.5	28.7	68	163.0	40.8	18	211.5	53.0	68	260.0	65.1
19	18.4	04.6	69	66.9	16.8	19	115.4	28.9	69	163.9	41.1	19	212.4	53.2	69	260.9	65.4
20	19.4	04.9	70	67.9	17.0	20	116.4	29.2	70	164.9	41.3	20	213.4	53.5	70	261.9	65.6
21	20.4	05.1	71	68.9	17.3	121	117.4	29.4	171	165.9	41.6	221	214.4	53.7	271	262.9	65.9
22	21.3	05.3	72	69.8	17.5	22	118.3	29.6	72	166.8	41.8	22	215.3	53.9	72	263.8	66.1
23	22.3	05.6	73	70.8	17.7	23	119.3	29.9	73	167.8	42.0	23	216.3	54.2	73	264.8	66.3
24	23.3	05.8	74	71.8	18.0	24	120.3	30.1	74	168.8	42.3	24	217.3	54.4	74	265.8	66.6
25	24.3	06.1	75	72.8	18.2	25	121.3	30.4	75	169.8	42.5	25	218.3	54.7	75	266.8	66.8
26	25.2	06.3	76	73.7	18.5	126	122.2	30.6	176	170.7	42.8	226	219.2	54.9	276	267.7	67.1
27	26.2	06.6	77	74.7	18.7	27	123.2	30.9	77	171.7	43.0	27	220.2	55.2	77	268.7	67.3
28	27.2	06.8	78	75.7	19.0	28	124.2	31.1	78	172.7	43.3	28	221.2	55.4	78	269.7	67.6
29	28.1	07.0	79	76.6	19.2	29	125.1	31.3	79	173.6	43.5	29	222.1	55.6	79	270.6	67.8
30	29.1	07.3	80	77.6	19.4	30	126.1	31.6	80	174.6	43.7	30	223.1	55.9	80	271.6	68.0
31	30.1	07.5	81	78.6	19.7	131	127.1	31.8	181	175.6	44.0	231	224.1	56.1	281	272.6	68.3
32	31.0	07.8	82	79.5	19.9	32	128.0	31.1	82	176.5	44.2	32	225.0	56.4	82	273.5	68.5
33	32.0	08.0	83	80.5	20.2	33	129.0	32.3	83	177.5	44.5	33	226.0	56.6	83	274.5	68.8
34	33.0	08.3	84	81.5	20.4	34	130.0	32.6	84	178.5	44.7	34	227.0	56.9	84	275.5	69.0
35	34.0	08.5	85	82.5	20.7	35	131.0	32.8	85	179.5	45.0	35	228.0	57.1	85	276.5	69.3
36	34.9	08.7	86	83.4	20.9	136	131.0	33.0	186	180.4	45.2	236	228.9	57.3	286	277.4	69.5
37	35.9	09.0	87	84.4	21.1	37	132.9	33.3	87	181.4	45.4	37	229.9	57.6	87	278.4	69.7
38	36.9	09.2	88	85.4	21.4	38	133.9	33.5	88	182.4	45.7	38	230.9	57.8	88	279.4	70.0
39	37.8	09.5	89	86.3	21.6	39	134.8	33.8	89	183.3	45.9	39	231.8	58.1	89	280.3	70.2
40	38.8	09.7	90	87.3	21.9	40	135.8	34.0	90	184.3	46.2	40	232.8	58.3	90	281.3	70.5
41	39.8	10.0	91	88.3	22.1	141	136.8	34.3	191	185.3	46.4	241	233.8	58.6	291	282.3	70.7
42	40.7	10.2	92	89.2	22.4	42	137.7	34.5	92	186.2	46.7	42	234.7	58.8	92	283.2	71.0
43	41.7	10.4	93	90.2	22.6	43	138.7	34.7	93	187.2	46.9	43	235.7	59.0	93	284.2	71.2
44	42.7	10.7	94	91.2	22.8	44	139.7	35.9	94	188.2	47.1	44	236.7	59.3	94	285.2	71.4
45	43.7	10.9	95	92.2	23.1	45	140.7	35.2	95	189.2	47.4	45	237.7	59.5	95	286.2	71.7
46	44.6	11.2	96	93.1	23.3	146	141.6	35.5	196	190.1	47.6	246	238.6	59.8	296	287.1	71.9
47	45.6	11.4	97	94.1	23.6	47	142.6	35.7	97	191.1	47.9	47	239.6	60.0	97	288.1	72.2
48	46.6	11.7	98	95.1	23.8	48	143.6	36.0	98	192.1	48.1	48	240.6	60.3	98	289.1	72.4
49	47.5	11.9	99	96.0	24.1	49	144.5	36.2	99	193.0	48.4	49	241.5	60.5	99	290.0	72.7
50	48.5	12.2	100	97.0	24.3	150	145.5	36.5	200	194.0	48.6	250	242.5	60.7	300	291.0	72.9
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $6\frac{1}{4}$  Points.



# Difference of Latitude and Departure for $1\frac{1}{2}$ Point. 63

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	01.0	00.3	251	48.8	14.8	101	96.7	29.3	151	144.5	43.8	201	192.4	58.3	251	240.2	72.8
2	01.9	00.6	52	49.8	15.1	02	97.6	29.6	52	145.5	44.1	02	193.3	58.6	52	241.2	73.1
3	02.9	00.9	53	50.7	15.4	03	98.6	29.9	53	146.4	44.4	03	194.3	58.9	53	242.1	73.4
4	03.8	01.2	54	51.7	15.7	04	99.5	30.2	54	147.4	44.7	04	195.2	59.2	54	243.1	73.7
5	04.8	01.5	55	52.6	16.0	05	100.5	30.5	55	148.3	45.0	05	196.2	59.5	55	244.0	74.0
6	05.7	01.7	56	53.6	16.2	106	101.4	30.7	156	149.3	45.2	206	197.1	59.7	256	245.0	74.2
7	06.7	02.0	57	54.5	16.5	07	102.4	31.0	57	150.2	45.5	07	198.1	60.0	57	245.9	74.5
8	07.7	02.3	58	55.5	16.8	08	103.4	31.3	58	151.2	45.8	08	199.1	60.3	58	246.9	74.8
9	08.6	02.6	59	56.5	17.1	09	104.3	31.6	59	152.2	46.1	09	200.0	60.6	59	247.9	75.1
10	09.6	02.9	60	57.4	17.4	10	105.3	31.9	60	153.1	46.4	10	201.0	60.9	60	248.8	75.4
11	10.5	03.2	61	58.4	17.7	111	106.2	32.2	161	154.1	46.7	211	201.9	61.2	261	249.8	75.7
12	11.5	03.5	62	59.3	18.0	12	107.2	32.5	62	155.0	47.0	12	202.9	61.5	62	250.7	76.0
13	12.4	03.8	63	60.3	18.3	13	108.1	32.8	63	156.0	47.3	13	203.8	61.8	63	251.7	76.3
14	13.4	04.1	64	61.2	18.6	14	109.1	33.1	64	156.9	47.6	14	224.8	62.1	64	252.6	76.6
15	14.4	04.4	65	62.2	18.9	15	110.1	33.4	65	157.9	47.9	15	205.8	62.4	65	253.6	76.9
16	15.3	04.6	66	63.2	19.1	116	111.0	33.6	166	158.9	48.1	216	206.7	62.6	266	254.6	77.1
17	16.3	04.9	67	64.1	19.4	17	112.0	33.9	67	159.8	48.4	17	207.7	62.9	67	255.5	77.4
18	17.2	05.2	68	65.1	19.7	18	112.9	34.2	68	160.8	48.7	18	208.6	63.2	68	256.5	77.7
19	18.2	05.5	69	66.0	20.0	19	113.9	34.5	69	161.7	49.0	19	209.6	63.5	69	257.4	78.0
20	19.1	05.8	70	67.0	20.3	20	114.8	34.8	70	162.7	49.3	20	210.5	63.8	70	258.4	78.3
21	20.1	06.1	71	67.9	20.6	121	115.8	35.1	171	163.6	49.6	221	211.5	64.1	271	259.3	78.6
22	21.1	06.4	72	68.9	20.9	22	116.8	35.4	72	164.6	49.9	22	212.5	64.4	72	260.3	78.9
23	22.0	06.7	73	69.9	21.2	23	117.7	35.7	73	165.6	50.2	23	213.4	64.7	73	261.3	79.2
24	23.0	07.0	74	70.8	21.5	24	118.7	36.0	74	166.5	50.5	24	214.4	65.0	74	262.2	79.5
25	23.9	07.3	75	71.8	21.8	25	119.6	36.3	75	167.5	50.8	25	215.3	65.3	75	263.2	79.8
26	24.9	07.5	76	72.7	22.0	126	120.6	36.5	176	168.4	51.0	226	216.3	65.5	276	264.2	80.0
27	25.8	07.8	77	73.7	22.3	27	121.5	36.8	77	169.4	51.3	27	216.2	65.8	77	265.1	80.3
28	26.8	08.1	78	74.6	22.6	28	122.5	37.1	78	170.3	51.6	28	218.2	66.1	78	266.0	80.6
29	27.8	08.4	79	75.6	22.9	29	123.5	37.4	79	171.3	51.9	29	219.2	66.4	79	267.0	80.9
30	28.7	08.7	80	76.6	23.2	30	124.4	37.7	80	172.3	52.2	30	220.1	66.7	80	268.0	81.2
31	29.7	09.0	81	77.5	23.5	131	125.4	38.0	181	173.2	52.5	231	221.1	67.0	281	268.9	81.5
32	30.6	09.3	82	78.5	23.8	32	126.3	38.3	82	174.2	52.8	32	222.0	67.3	82	269.9	81.8
33	31.6	09.6	83	79.4	24.1	33	127.3	38.6	83	175.1	53.1	33	223.0	67.6	83	270.8	82.1
34	32.5	09.9	84	80.4	24.4	34	128.2	38.9	84	176.1	53.4	34	223.9	67.9	84	271.8	82.4
35	33.5	10.2	85	81.3	24.7	35	129.2	39.2	85	177.0	53.7	35	224.9	68.2	85	272.7	82.7
36	34.5	10.4	86	82.3	24.9	136	130.2	39.4	186	178.0	53.9	236	225.9	68.4	286	273.7	82.9
37	35.4	10.7	87	83.3	25.2	37	131.1	39.7	87	179.0	54.2	37	226.8	68.7	87	274.7	83.2
38	36.4	11.0	88	84.2	25.5	38	132.1	40.0	88	179.9	54.5	38	227.8	69.0	88	275.6	83.5
39	37.3	11.3	89	85.2	25.8	39	133.0	40.3	89	180.9	54.8	39	228.7	69.3	89	276.6	83.8
40	38.3	11.6	90	86.1	26.1	40	134.0	40.6	90	181.8	55.1	40	229.7	69.6	90	277.5	84.1
41	39.2	11.9	91	87.1	26.4	141	134.9	40.9	191	182.8	55.4	241	230.6	69.9	291	278.5	84.4
42	40.2	12.2	92	88.0	26.7	42	135.9	41.2	92	183.7	55.7	42	231.6	70.2	92	279.4	84.7
43	41.2	12.5	93	89.0	27.0	43	136.9	41.5	93	184.7	56.0	43	232.5	70.5	93	280.4	85.0
44	42.1	12.8	94	90.0	27.3	44	137.8	41.8	94	185.7	56.3	44	233.5	70.8	94	281.4	85.3
45	43.1	13.1	95	90.9	27.6	45	138.8	42.1	95	186.6	56.6	45	234.5	71.0	95	282.3	85.6
46	44.0	13.3	96	91.9	27.8	146	139.7	42.3	196	187.6	56.8	246	235.4	71.3	296	283.3	85.8
47	45.0	13.6	97	92.8	28.1	47	140.7	42.6	97	188.5	57.1	47	236.4	71.6	97	284.2	86.1
48	45.9	13.9	98	93.8	28.4	48	141.6	42.9	98	189.5	57.4	48	237.3	71.9	98	285.2	86.4
49	46.9	14.2	99	94.7	28.7	49	142.6	43.2	99	190.4	57.7	49	238.3	72.2	99	286.1	86.7
50	47.9	14.5	100	95.7	29.0	150	143.5	43.5	200	191.4	58.0	250	239.2	72.5	300	287.1	87.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $6\frac{1}{2}$  Points.

# 64 Difference of Latitude and Departure for 1 $\frac{1}{4}$ Point.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.3	51	48.0	17.2	101	95.1	34.0	151	142.2	50.9	201	189.2	67.7	251	236.3	84.5
2	01.9	00.7	52	49.0	17.5	102	96.0	34.4	152	143.1	51.2	202	190.2	68.0	252	237.3	84.9
3	02.8	01.0	53	49.9	17.9	103	97.0	34.7	153	144.0	51.5	203	191.1	68.4	253	238.2	85.2
4	03.8	01.3	54	50.8	18.2	104	97.9	35.0	154	145.0	51.9	204	192.1	68.7	254	239.1	85.5
5	04.7	01.7	55	51.8	18.5	105	98.9	35.4	155	145.9	52.2	205	193.0	69.0	255	240.1	85.9
6	05.6	02.0	56	52.7	18.9	106	99.8	35.7	156	146.9	52.5	206	194.0	69.4	256	241.0	86.2
7	06.6	02.4	57	53.7	19.2	107	100.7	36.0	157	147.8	52.9	207	194.9	69.7	257	242.0	86.6
8	07.5	02.7	58	54.6	19.5	108	101.7	36.4	158	148.8	53.2	208	195.8	70.1	258	242.9	86.9
9	08.5	03.0	59	55.5	19.9	109	102.6	36.7	159	149.7	53.6	209	196.8	70.4	259	243.8	87.2
10	09.4	03.4	60	56.5	20.2	110	103.6	37.0	160	150.6	53.9	210	197.7	70.7	260	244.8	87.6
11	10.4	03.7	61	57.4	20.5	111	104.5	37.4	161	151.6	54.2	211	198.7	71.1	261	245.7	87.9
12	11.3	04.0	62	58.4	20.9	112	105.4	37.7	162	152.5	54.6	212	199.6	71.4	262	246.7	88.2
13	12.2	04.4	63	59.3	21.2	113	106.4	38.1	163	153.5	54.9	213	200.5	71.7	263	247.6	88.6
14	13.2	04.7	64	60.3	21.6	114	107.3	38.4	164	154.4	55.2	214	201.5	72.1	264	248.6	88.9
15	14.1	05.1	65	61.2	21.9	115	108.3	38.7	165	155.3	55.6	215	202.4	72.4	265	249.5	89.2
16	15.1	05.4	66	62.1	22.2	116	109.2	39.1	166	156.3	55.9	216	203.4	72.7	266	250.4	89.6
17	16.0	05.7	67	63.1	22.6	117	110.2	39.4	167	157.2	56.2	217	204.3	73.1	267	251.4	89.9
18	17.0	06.1	68	64.0	22.9	118	111.1	39.7	168	158.2	56.6	218	205.2	73.4	268	252.3	90.3
19	17.9	06.4	69	65.0	23.2	119	112.0	40.1	169	159.1	56.9	219	206.2	73.8	269	253.3	90.6
20	18.8	06.7	70	65.9	23.6	120	112.0	40.4	170	160.1	57.3	220	207.1	74.1	270	254.2	90.9
21	19.8	07.1	71	66.8	23.9	121	113.9	40.8	171	161.0	57.6	221	208.1	74.4	271	255.1	91.3
22	20.7	07.4	72	67.8	24.2	122	114.9	41.1	172	161.9	57.9	222	209.0	74.8	272	256.1	91.6
23	21.7	07.7	73	68.7	24.6	123	115.8	41.4	173	162.9	58.3	223	210.0	75.1	273	257.0	91.9
24	22.6	08.1	74	69.7	24.9	124	116.7	41.8	174	163.8	58.6	224	210.9	75.4	274	258.0	92.3
25	23.5	08.4	75	70.6	25.3	125	117.7	42.1	175	164.8	58.9	225	211.8	75.8	275	258.9	92.6
26	24.5	08.8	76	71.6	25.6	126	118.6	42.4	176	165.7	59.3	226	212.8	76.1	276	259.9	93.0
27	25.4	09.1	77	72.5	25.9	127	119.6	42.8	177	166.6	59.6	227	213.7	76.5	277	260.8	93.3
28	26.4	09.4	78	73.4	26.3	128	120.5	43.1	178	167.6	60.0	228	214.7	76.8	278	261.7	93.6
29	27.3	09.8	79	74.4	26.6	129	121.5	43.4	179	168.5	60.3	229	215.6	77.1	279	262.7	94.0
30	27.2	10.1	80	75.3	26.9	130	122.4	43.8	180	169.5	60.6	230	216.5	77.5	280	263.7	94.3
31	29.2	10.4	81	76.3	27.3	131	123.3	44.1	181	170.4	61.0	231	217.5	77.8	281	264.6	94.6
32	30.1	10.8	82	77.2	27.6	132	124.3	44.5	182	171.4	61.3	232	218.4	78.1	282	265.5	95.0
33	31.1	11.1	83	78.1	28.0	133	125.2	44.8	183	172.3	61.6	233	219.4	78.5	283	266.4	95.3
34	32.0	11.5	84	79.1	28.3	134	126.2	45.1	184	173.2	62.0	234	220.3	78.8	284	267.4	95.6
35	33.9	11.8	85	80.0	28.6	135	127.1	45.5	185	174.2	62.3	235	221.3	79.1	285	268.3	96.0
36	33.9	12.1	86	81.0	29.0	136	128.0	45.8	186	175.1	62.6	236	222.2	79.5	286	269.3	96.3
37	34.8	12.5	87	81.9	29.3	137	129.0	46.1	187	176.1	63.0	237	223.1	79.8	287	270.2	96.7
38	35.8	12.8	88	82.9	29.6	138	129.9	46.5	188	177.0	63.3	238	224.1	80.2	288	271.2	96.0
39	36.7	13.1	89	83.8	30.0	139	130.9	46.8	189	177.9	63.7	239	225.0	80.5	289	272.1	97.3
40	37.7	13.5	90	84.7	30.3	140	131.8	47.2	190	178.9	64.0	240	226.0	80.8	290	273.0	97.7
41	38.6	13.8	91	85.7	30.6	141	132.8	47.5	191	179.8	64.3	241	226.9	81.2	291	274.0	98.0
42	39.5	14.1	92	86.6	31.0	142	133.7	47.8	192	180.8	64.7	242	227.8	81.5	292	274.9	98.3
43	40.5	14.5	93	87.6	31.3	143	134.6	48.2	193	181.7	65.0	243	228.8	81.8	293	275.9	98.7
44	41.4	14.8	94	88.5	31.7	144	135.6	48.5	194	182.6	65.3	244	229.7	82.2	294	276.8	99.0
45	42.4	15.2	95	89.4	32.0	145	136.5	48.8	195	183.6	65.7	245	230.7	82.5	295	277.7	99.4
46	43.3	15.5	96	90.4	32.3	146	137.5	49.2	196	184.5	66.0	246	231.6	82.9	296	278.7	99.7
47	44.3	15.8	97	91.3	32.7	147	138.4	49.5	197	185.5	66.3	247	232.5	83.2	297	279.6	100.0
48	45.2	16.2	98	92.3	33.0	148	139.3	49.8	198	186.4	66.7	248	233.5	83.5	298	280.6	100.4
49	46.1	16.5	99	93.2	33.3	149	140.3	50.2	199	187.4	67.0	249	234.4	83.9	299	281.5	100.7
50	47.1	16.8	100	94.2	33.7	150	141.2	50.5	200	188.3	67.4	250	235.4	84.2	300	282.5	101.0
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 6  $\frac{1}{4}$  Points.



# Difference of Latitude and Departure for 2 Points. 65

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.9	00.4	51	47.1	19.5	101	93.3	38.7	151	139.5	57.8	201	185.7	76.9	251	231.9	96.1
2	01.8	00.8	52	48.0	19.9	02	94.2	39.0	52	140.4	58.2	02	186.6	77.3	52	232.8	96.4
3	02.8	01.1	53	49.0	20.3	03	95.2	39.4	53	141.4	58.6	03	187.6	77.7	53	233.8	96.8
4	03.7	01.5	54	49.9	20.7	04	96.1	39.8	54	142.3	58.9	04	188.5	78.1	54	234.7	97.2
5	04.6	01.9	55	50.8	21.0	05	97.0	40.2	55	143.2	59.3	05	189.4	78.5	55	235.6	97.6
6	05.5	02.3	56	51.7	21.4	106	97.9	40.6	156	144.1	59.7	206	190.3	78.8	256	236.5	98.0
7	06.5	02.7	57	52.7	21.8	07	98.9	41.0	57	145.1	60.1	07	191.3	79.2	57	237.5	98.4
8	07.4	03.1	58	53.6	22.2	08	99.8	41.3	58	146.0	60.5	08	192.2	79.6	58	238.4	98.7
9	08.3	03.4	59	54.5	22.6	09	100.7	41.7	59	146.9	60.9	09	193.1	80.0	59	239.3	99.1
10	09.2	03.8	60	55.4	23.0	10	101.6	42.1	60	147.8	61.2	10	194.0	80.4	60	240.2	99.5
11	10.2	04.2	61	56.4	23.3	111	102.6	42.5	161	148.8	61.6	211	194.9	80.8	261	241.1	99.9
12	11.1	04.6	62	57.3	23.7	12	103.5	42.9	62	149.7	62.0	12	195.9	81.1	62	242.1	100.3
13	12.0	05.0	63	58.2	24.1	13	104.4	43.2	63	150.6	62.4	13	196.8	81.5	63	243.0	100.7
14	12.9	05.4	64	59.1	24.5	14	105.3	43.6	64	151.5	62.8	14	197.7	81.9	64	243.9	101.0
15	13.9	05.7	65	60.1	24.9	15	106.3	44.0	65	152.5	63.1	15	198.6	82.3	65	244.8	101.4
16	14.8	06.1	66	61.0	25.3	116	107.2	44.4	166	153.4	63.5	216	199.6	82.7	266	245.8	101.8
17	15.7	06.5	67	61.9	25.6	17	108.1	44.8	67	154.3	63.9	17	200.5	83.0	67	246.7	102.2
18	16.6	06.9	68	62.8	26.0	18	109.0	45.2	68	155.2	64.3	18	201.4	83.4	68	247.6	102.6
19	17.6	07.3	69	63.8	26.4	19	109.9	45.5	69	156.1	64.7	19	202.3	83.8	69	248.5	103.0
20	18.5	07.7	70	64.7	26.8	20	110.9	45.9	70	157.1	65.1	20	203.3	84.2	70	249.5	103.3
21	19.4	08.0	71	65.6	27.2	21	111.8	46.3	71	158.0	65.4	21	204.2	84.6	71	250.4	103.7
22	20.3	08.4	72	66.5	27.6	22	112.7	46.7	72	158.9	65.8	22	205.1	85.0	72	251.3	104.1
23	21.3	08.8	73	67.5	27.9	23	113.6	47.1	73	159.8	66.2	23	206.0	85.3	73	252.2	104.5
24	22.2	09.2	74	68.4	28.3	24	114.6	47.5	74	160.8	66.6	24	207.0	85.7	74	253.2	104.9
25	23.1	09.6	75	69.3	28.7	25	115.5	47.8	75	161.7	67.0	25	207.9	86.1	75	254.1	105.2
26	24.0	10.0	76	70.2	29.1	26	116.4	48.2	76	162.6	67.4	26	208.8	86.5	76	255.0	105.6
27	24.9	10.3	77	71.1	29.5	27	117.3	48.6	77	163.5	67.7	27	209.7	86.9	77	255.9	106.0
28	25.9	10.7	78	72.1	29.9	28	118.3	49.0	78	164.5	68.1	28	210.7	87.3	78	256.9	106.4
29	26.8	11.1	79	73.0	30.2	29	119.2	49.4	79	165.4	68.5	29	211.6	87.6	79	257.8	106.8
30	27.7	11.5	80	73.9	30.6	30	120.1	49.8	80	166.3	68.9	30	212.5	88.0	80	258.7	107.2
31	28.6	11.9	81	74.8	31.0	31	121.0	50.1	81	167.2	69.3	31	213.4	88.4	81	259.6	107.5
32	29.6	12.2	82	75.8	31.4	32	122.0	50.5	82	168.2	69.7	32	214.4	88.8	82	260.6	107.9
33	30.5	12.6	83	76.7	31.8	33	122.9	50.9	83	169.1	70.0	33	215.3	89.2	83	261.5	108.3
34	31.4	13.0	84	77.6	32.1	34	123.8	51.3	84	170.0	70.4	34	216.2	89.6	84	262.4	108.7
35	32.3	13.4	85	78.5	32.5	35	124.7	51.7	85	170.9	70.8	35	217.1	89.9	85	263.3	109.1
36	33.3	13.8	86	79.5	32.9	36	125.7	52.0	86	171.9	71.2	36	218.0	90.3	86	264.2	109.5
37	34.2	14.2	87	80.4	33.3	37	126.6	52.4	87	172.8	71.6	37	219.0	90.7	87	265.2	109.8
38	35.1	14.5	88	81.3	33.7	38	127.5	52.8	88	173.7	72.0	38	219.9	91.1	88	266.1	110.2
39	36.0	14.9	89	82.2	34.1	39	128.4	53.2	89	174.6	72.3	39	220.8	91.5	89	267.0	110.6
40	37.0	15.3	90	83.2	34.4	40	129.4	53.6	90	175.6	72.7	40	221.7	91.9	90	267.9	111.0
41	37.9	15.7	91	84.1	34.8	41	130.3	54.0	91	176.5	73.1	41	222.7	92.2	91	268.9	111.4
42	38.8	16.1	92	85.0	35.2	42	131.2	54.3	92	177.4	73.5	42	223.6	92.6	92	269.8	111.8
43	39.7	16.5	93	85.9	35.6	43	132.1	54.7	93	178.3	73.9	43	224.5	93.0	93	270.7	112.1
44	40.6	16.8	94	86.9	36.0	44	133.0	55.1	94	179.2	74.2	44	225.4	93.4	94	271.6	112.5
45	41.6	17.2	95	87.8	36.4	45	134.0	55.5	95	180.2	74.6	45	226.4	93.8	95	272.6	112.9
46	42.5	17.6	96	88.7	36.7	46	134.9	55.9	96	181.1	75.0	46	227.3	94.1	96	273.5	113.3
47	43.4	18.0	97	89.6	37.1	47	135.8	56.3	97	182.0	75.4	47	228.2	94.5	97	274.4	113.7
48	44.4	18.4	98	90.6	37.5	48	136.7	56.6	98	182.9	75.8	48	229.1	94.9	98	275.3	114.0
49	45.3	18.8	99	91.5	37.9	49	137.7	57.0	99	183.9	76.2	49	230.1	95.3	99	276.3	114.4
50	46.2	19.1	100	92.4	38.3	50	138.6	57.4	100	184.8	76.5	50	231.0	95.7	100	277.2	114.8
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

T

for 6 Points.

Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep	Dift	Lat	Dep
1	00.9	00.4	51	46.1	21.8	101	91.3	43.2	151	136.5	64.6	201	181.7	85.9	251	226.9	107.3
2	01.8	00.9	52	47.0	22.2	02	92.2	43.6	52	137.4	65.0	02	182.6	86.4	52	227.8	107.8
3	02.7	01.3	53	47.9	22.7	03	93.1	44.0	53	138.3	65.4	03	183.5	86.8	53	228.7	108.2
4	03.6	01.7	54	48.8	23.1	04	94.0	44.5	54	139.2	65.8	04	184.4	87.2	54	229.6	108.6
5	04.5	02.1	55	49.7	23.5	05	94.9	44.9	55	140.1	66.3	05	185.3	87.7	55	230.5	109.0
6	05.4	02.6	56	50.6	23.9	106	95.8	45.3	156	141.0	66.7	206	186.2	88.1	256	231.4	109.5
7	06.3	03.0	57	51.5	24.4	07	96.7	45.8	57	141.9	67.1	07	187.1	88.5	57	232.3	109.9
8	07.2	03.4	58	52.4	24.8	08	97.6	46.2	58	142.8	67.6	08	188.0	88.9	58	233.2	110.3
9	08.1	03.8	59	53.3	25.2	09	98.5	46.6	59	143.7	68.0	09	188.9	89.4	59	234.1	110.7
10	09.0	04.3	60	54.2	25.7	10	99.4	47.0	60	144.6	68.4	10	189.8	89.8	60	235.0	111.2
11	09.9	04.7	61	55.1	26.1	111	100.3	47.5	161	145.5	68.8	211	190.7	90.2	261	235.9	111.6
12	10.8	05.1	62	56.0	26.5	12	101.2	47.9	62	146.4	69.3	12	191.6	90.6	62	236.8	112.0
13	11.8	05.6	63	57.0	26.9	13	102.1	48.3	63	147.3	69.7	13	192.5	91.1	63	237.7	112.5
14	12.7	06.0	64	57.9	27.4	14	103.0	48.7	64	148.2	70.1	14	193.4	91.5	64	238.6	112.9
15	13.6	06.4	65	58.8	27.8	15	103.9	49.2	65	149.1	70.6	15	194.3	91.9	65	239.5	113.3
16	14.5	06.8	66	59.7	28.2	116	104.8	49.6	166	150.0	71.0	216	195.2	92.4	266	240.4	113.7
17	15.4	07.3	67	60.6	28.6	17	105.8	50.0	67	151.0	71.4	17	196.1	92.8	67	241.3	114.2
18	16.3	07.7	68	61.5	29.1	18	106.7	50.5	68	151.9	71.8	18	197.0	93.2	68	242.2	114.6
19	17.2	08.1	69	62.4	29.5	19	107.6	50.9	69	152.8	72.3	19	197.9	93.6	69	243.1	115.0
20	18.1	08.6	70	63.3	29.9	20	108.5	51.3	70	153.7	72.7	20	198.8	94.1	70	244.0	115.5
21	19.0	09.0	71	64.2	30.4	121	109.4	51.7	171	154.6	73.1	221	199.8	94.5	271	245.0	115.9
22	19.9	09.4	72	65.1	30.8	22	110.3	52.2	72	155.5	73.5	22	200.7	94.9	72	245.9	116.3
23	20.8	09.8	73	66.0	31.2	23	111.2	52.6	73	156.4	74.0	23	201.6	95.4	73	246.8	116.7
24	21.7	10.3	74	66.9	31.6	24	112.1	53.0	74	157.3	74.4	24	202.5	95.8	74	247.7	117.2
25	22.6	10.7	75	67.8	32.1	25	113.0	53.5	75	158.2	74.8	25	203.4	96.2	75	248.6	117.6
26	23.5	11.1	76	68.7	32.5	126	113.9	53.9	176	159.1	75.3	226	204.3	96.6	276	249.5	118.0
27	24.4	11.5	77	69.6	32.9	27	114.8	54.3	77	160.0	75.7	27	205.2	97.1	77	250.4	118.4
28	25.3	12.0	78	70.5	33.4	28	115.7	54.7	78	160.9	76.1	28	206.1	97.5	78	251.3	118.9
29	26.2	12.4	79	71.4	33.8	29	116.6	55.2	79	161.8	76.5	29	207.0	97.9	79	252.2	119.3
30	27.1	12.8	80	72.3	34.2	30	117.5	55.6	80	162.7	77.0	30	207.9	98.3	80	253.1	119.7
31	28.0	13.3	81	73.2	34.6	131	118.4	56.0	181	163.6	77.4	231	208.8	98.8	281	254.0	120.2
32	28.9	13.7	82	74.1	35.1	32	119.3	56.4	82	164.5	77.8	32	209.7	99.2	82	254.9	120.6
33	29.8	14.1	83	75.0	35.5	33	120.2	56.9	83	165.4	78.2	33	210.6	99.6	83	255.8	121.0
34	30.7	14.5	84	75.9	35.9	34	121.1	57.3	84	166.3	78.7	34	211.5	100.1	84	256.7	121.4
35	31.6	15.0	85	76.8	36.3	35	122.0	57.7	85	167.2	79.1	35	212.4	100.5	85	257.6	121.9
36	32.5	15.4	86	77.7	36.8	136	122.9	58.2	186	168.1	79.5	236	213.3	100.9	286	258.5	122.3
37	33.4	15.8	87	78.6	37.2	37	123.8	58.6	87	169.0	80.0	37	214.2	101.3	87	259.4	122.7
38	34.4	16.2	88	79.6	37.6	38	124.7	59.0	88	169.9	80.4	38	215.1	101.8	88	260.3	123.1
39	35.3	16.7	89	80.5	38.1	39	125.6	59.4	89	170.8	80.8	39	216.0	102.2	89	261.2	123.6
40	36.2	17.1	90	81.4	38.5	40	126.5	59.9	90	171.7	81.2	40	216.9	102.2	90	262.1	124.0
41	37.1	17.5	91	82.3	38.9	141	127.4	60.3	191	172.6	81.7	241	217.8	103.0	291	263.0	124.4
42	38.0	18.0	92	83.2	39.3	42	128.4	60.7	92	173.6	82.1	42	218.7	103.5	92	263.9	124.9
43	38.9	18.4	93	84.1	39.8	43	129.3	61.1	93	174.5	82.5	43	219.6	103.9	93	264.8	125.3
44	39.8	18.8	94	85.0	40.2	44	130.2	61.6	94	175.4	83.0	44	220.5	104.3	94	265.7	125.7
45	40.7	19.2	95	85.9	40.6	45	131.1	62.0	95	176.3	83.4	45	221.4	104.8	95	266.6	126.1
46	41.6	19.0	96	86.8	41.7	146	132.0	62.4	196	177.2	83.8	246	222.4	105.2	296	267.6	126.6
47	42.5	20.1	97	87.7	41.5	47	132.9	62.9	97	178.1	84.2	47	223.3	105.6	97	268.5	127.0
48	43.4	20.5	98	88.6	41.9	48	133.8	63.3	98	179.0	84.7	48	224.2	106.0	98	269.4	127.4
49	44.3	21.0	99	89.5	42.3	49	134.7	63.7	99	179.9	85.1	49	225.1	106.5	99	270.3	127.8
50	45.2	21.4	100	90.4	42.8	150	135.6	64.1	200	180.8	85.5	250	226.0	106.9	300	271.2	128.3
Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat	Dift	Dep	Lat

for  $5\frac{1}{4}$  Points.



# Difference of Latitude and Departure for 2½ Points.

67

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.5	51	45.0	24.0	101	89.1	47.6	151	133.2	71.1	201	177.3	94.7	251	221.4	118.3
2	01.8	00.9	52	45.9	24.5	02	90.0	48.1	52	134.1	71.6	02	178.2	95.2	52	222.3	118.7
3	02.6	01.4	53	46.7	25.0	03	90.8	48.5	53	134.9	72.1	03	179.0	95.6	53	223.1	119.2
4	03.5	01.9	54	47.6	25.4	04	91.7	49.0	54	135.8	72.6	04	179.9	96.1	54	224.0	119.7
5	04.4	02.4	55	48.5	25.9	05	92.6	49.5	55	136.7	73.0	05	180.8	96.6	55	224.9	120.1
6	05.3	02.8	56	49.4	26.4	106	93.5	49.9	156	137.6	73.5	206	181.7	97.1	256	225.8	120.6
7	06.2	03.3	57	50.3	26.9	07	94.4	50.4	57	138.5	74.0	07	182.6	97.5	57	226.7	121.1
8	07.1	03.8	58	51.2	27.3	08	95.3	50.9	58	139.4	74.4	08	183.5	98.0	58	227.6	121.6
9	07.9	04.2	59	52.0	27.8	09	96.1	51.4	59	140.3	74.9	09	184.3	98.5	59	228.4	122.0
10	08.8	04.7	60	52.9	28.3	10	97.0	51.8	60	141.1	75.4	10	185.2	98.9	60	229.3	122.5
11	09.7	05.2	61	53.8	28.7	111	97.9	52.3	161	142.0	75.9	211	186.1	99.4	261	230.2	123.0
12	10.6	05.7	62	54.7	29.2	12	98.8	52.8	62	142.9	76.3	12	187.0	99.9	62	231.1	123.4
13	11.5	06.1	63	55.6	29.7	13	99.7	53.2	63	143.8	76.8	13	187.9	100.4	63	232.0	123.9
14	12.3	06.6	64	56.4	30.2	14	100.5	53.7	64	144.6	77.3	14	188.7	100.8	64	232.8	124.4
15	13.2	07.1	65	57.3	30.6	15	101.4	54.2	65	145.5	77.7	15	189.6	101.3	65	233.7	124.9
16	14.1	07.5	66	58.2	31.1	116	102.3	54.7	166	146.4	78.2	216	190.5	101.8	266	234.6	125.3
17	15.0	08.0	67	59.1	31.6	17	103.2	55.1	67	147.3	78.7	17	191.4	102.2	67	235.5	125.8
18	15.9	08.5	68	60.0	32.0	18	104.1	55.6	68	148.2	79.2	18	192.3	102.7	68	236.4	126.3
19	16.8	09.0	69	60.9	32.5	19	105.0	56.1	69	149.1	79.6	19	193.2	103.2	69	237.3	126.7
20	17.6	09.4	70	61.7	33.0	20	105.8	56.5	70	149.9	80.1	20	194.0	103.7	70	238.1	127.2
21	18.5	09.9	71	62.6	33.5	121	106.7	57.0	171	150.8	80.6	221	194.9	104.1	271	239.0	127.7
22	19.4	10.4	72	63.5	33.9	22	107.6	57.5	72	151.7	81.0	22	195.8	104.6	72	239.9	128.2
23	20.3	10.8	73	64.4	34.4	23	108.5	58.0	73	152.6	81.5	23	196.7	105.1	73	240.8	128.6
24	21.2	11.3	74	65.3	34.9	24	109.4	58.4	74	153.5	82.0	24	197.6	105.5	74	241.7	129.1
25	22.1	11.8	75	66.2	35.3	25	110.3	58.9	75	154.3	82.5	25	198.4	106.0	75	242.5	129.6
26	22.9	12.3	76	67.0	35.8	126	111.1	59.4	176	155.2	82.9	226	199.3	106.5	276	243.4	130.0
27	23.8	12.7	77	67.9	36.3	27	112.0	59.8	77	156.1	83.4	27	200.2	107.0	77	244.3	130.5
28	24.7	13.2	78	68.8	36.8	28	112.9	60.3	78	157.0	83.9	28	201.1	107.4	78	245.2	131.0
29	25.6	13.7	79	69.7	37.2	29	113.8	60.8	79	157.9	84.3	29	202.0	107.9	79	246.1	131.5
30	26.5	14.1	80	70.6	37.7	30	114.7	61.3	80	158.8	84.8	30	202.9	108.4	80	247.0	131.9
31	27.3	14.6	81	71.4	38.2	131	115.5	61.7	181	159.6	85.3	231	203.7	108.8	281	247.8	132.4
32	28.2	15.1	82	72.3	38.6	32	116.4	62.2	82	160.5	85.8	32	204.6	109.3	82	248.7	132.9
33	29.1	15.5	83	73.2	39.1	33	117.3	62.7	83	161.4	86.2	33	205.5	109.8	83	249.6	133.3
34	30.0	16.0	84	74.1	39.6	34	118.2	63.1	84	162.3	86.7	34	206.4	110.3	84	250.5	133.8
35	30.9	16.5	85	75.0	40.1	35	119.1	63.6	85	163.2	87.2	35	207.3	110.7	85	251.4	134.3
36	31.8	17.0	86	75.9	40.5	136	120.0	64.1	186	164.1	87.6	236	208.2	111.2	286	252.3	134.8
37	32.6	17.4	87	76.7	41.0	37	120.8	64.5	87	164.9	88.1	37	209.0	111.7	87	253.1	135.2
38	33.5	17.9	88	77.6	41.5	38	121.7	65.0	88	165.8	88.6	38	209.9	112.1	88	254.0	135.7
39	34.4	18.4	89	78.5	41.9	39	122.6	65.5	89	166.7	89.1	39	210.8	112.6	89	254.9	136.2
40	35.3	18.8	90	79.4	42.4	40	123.5	66.0	90	167.6	89.5	40	211.7	113.1	90	255.8	136.6
41	36.2	19.3	91	80.3	42.9	141	124.4	66.4	191	168.5	90.0	241	212.6	113.5	291	256.7	137.1
42	37.0	19.8	92	81.1	43.4	42	125.2	66.9	92	169.3	90.5	42	213.4	114.0	92	257.5	137.6
43	37.9	20.3	93	82.0	43.8	43	126.1	67.4	93	170.2	90.9	43	214.3	114.5	93	258.4	138.1
44	38.8	20.7	94	82.9	44.3	44	127.0	67.8	94	171.1	91.4	44	215.2	115.0	94	259.3	138.5
45	39.7	21.2	95	83.8	44.8	45	127.9	68.3	95	172.0	91.9	45	216.1	115.4	95	260.2	139.0
46	40.6	21.7	96	84.7	45.2	146	128.8	68.8	196	172.9	92.4	246	217.0	115.9	296	261.1	139.5
47	41.5	22.1	97	85.6	45.7	47	129.7	69.3	97	173.8	92.8	47	217.9	116.4	97	262.0	139.9
48	42.3	22.6	98	86.4	46.2	48	130.5	69.7	98	174.6	93.3	48	218.7	116.8	98	262.8	140.4
49	43.2	23.1	99	87.3	46.6	49	131.4	70.2	99	175.5	93.8	49	219.6	117.3	99	263.7	140.9
50	44.1	23.6	100	88.2	47.1	150	132.3	70.7	200	176.4	94.2	250	220.5	117.8	300	264.6	141.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for 5½ Points.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.9	00.6	51	43.7	26.2	101	86.6	51.9	151	129.5	77.6	201	172.4	103.3	251	215.3	129.0
2	01.7	01.0	52	44.6	26.7	02	87.5	52.4	52	130.4	78.1	02	173.3	103.8	52	216.1	129.5
3	02.6	01.6	53	45.5	27.2	03	88.3	52.9	53	131.2	78.6	03	174.1	104.3	53	217.0	130.0
4	03.4	02.1	54	46.3	27.8	04	89.2	53.4	54	132.1	79.1	04	175.0	104.8	54	217.9	130.5
5	04.3	02.6	55	47.2	28.3	05	90.1	54.0	55	132.9	79.7	05	175.8	105.4	55	218.7	131.0
6	05.1	03.1	56	48.0	28.8	106	90.9	54.5	156	133.8	80.2	206	176.7	105.9	256	219.6	131.6
7	06.0	03.6	57	48.9	29.3	07	91.8	55.0	57	134.7	80.7	07	177.5	106.4	57	220.4	132.1
8	06.9	04.1	58	49.7	29.8	08	92.6	55.5	58	135.5	81.2	08	178.4	106.9	58	221.3	132.6
9	07.7	04.6	59	50.6	30.3	09	93.5	56.0	59	136.4	81.7	09	179.3	107.4	59	222.1	133.1
10	08.6	05.1	60	51.5	30.8	10	94.3	56.5	60	137.2	82.2	10	180.1	107.9	60	223.0	133.6
11	09.4	05.7	61	52.3	31.4	111	95.2	57.0	161	138.1	82.7	211	181.0	108.4	261	223.9	134.1
12	10.3	06.2	62	53.2	31.9	12	96.1	57.6	62	138.9	83.3	12	181.8	109.0	62	224.7	134.6
13	11.2	06.7	63	54.0	32.4	13	96.9	58.1	63	139.8	83.8	13	182.7	109.5	63	225.6	135.2
14	12.0	07.2	64	54.9	32.9	14	97.8	58.6	64	140.7	84.3	14	183.5	110.0	64	226.4	135.7
15	12.9	07.7	65	55.8	33.4	15	98.5	59.1	65	141.5	84.8	15	184.4	110.5	65	227.3	136.2
16	13.7	08.2	66	56.6	33.9	116	99.5	59.6	166	142.4	85.3	216	185.3	111.0	266	228.1	136.7
17	14.6	08.7	67	57.5	34.4	17	100.4	60.1	67	143.2	85.8	17	186.1	111.6	67	229.0	137.2
18	15.4	09.3	68	58.3	35.0	18	101.2	60.6	68	144.1	86.3	18	187.0	112.0	68	229.9	137.7
19	16.3	09.8	69	59.2	35.5	19	102.1	61.2	69	145.0	86.9	19	187.8	112.6	69	230.7	138.2
20	17.2	10.3	70	60.0	36.0	20	102.9	61.7	70	145.8	87.4	20	188.7	113.1	70	231.6	138.8
21	18.0	10.8	71	60.9	36.5	121	103.8	62.2	171	146.7	87.9	221	189.6	113.6	271	232.4	139.3
22	18.9	11.3	72	61.8	37.0	22	104.6	62.7	72	147.5	88.4	22	190.4	114.1	72	233.3	139.8
23	19.7	11.8	73	62.6	37.6	23	105.5	63.2	73	148.4	88.9	23	191.3	114.6	73	234.2	140.3
24	20.6	12.3	74	63.5	38.0	24	106.4	63.7	74	149.2	89.4	24	192.1	115.1	74	235.0	140.8
25	21.4	12.9	75	64.3	38.6	25	107.2	64.2	75	150.1	89.6	25	193.0	115.6	75	235.9	141.3
26	22.3	13.4	76	65.2	39.1	126	108.1	64.8	176	151.0	90.4	226	193.8	116.1	276	236.7	141.8
27	23.2	13.9	77	66.0	39.6	27	108.9	65.3	77	151.8	91.0	27	194.7	116.7	77	237.6	142.4
28	24.0	14.4	78	66.9	40.1	28	109.8	65.8	78	152.7	91.5	28	195.6	117.2	78	238.4	142.9
29	24.9	14.9	79	67.8	40.6	29	110.6	66.3	79	153.5	92.0	29	196.4	117.7	79	239.3	143.4
30	25.7	15.4	80	68.6	41.1	30	111.5	66.8	80	154.4	92.5	30	197.3	118.2	80	240.2	143.9
31	26.6	15.9	81	69.5	41.6	131	112.4	67.3	181	155.2	93.0	231	198.1	118.7	281	241.0	144.4
32	27.4	16.4	82	70.3	42.1	32	113.2	67.8	82	156.1	93.5	32	199.0	119.2	82	241.9	144.9
33	28.3	17.0	83	71.2	42.7	33	114.1	68.4	83	157.0	94.0	33	199.8	119.7	83	242.7	145.4
34	29.2	17.5	84	72.0	43.2	34	114.9	68.9	84	157.8	94.6	34	200.7	120.3	84	243.6	146.0
35	30.0	18.0	85	72.9	43.7	35	115.8	69.4	85	158.7	95.1	35	201.6	120.8	85	244.4	146.5
36	30.9	18.5	86	73.8	44.2	136	116.6	69.9	186	159.5	95.6	236	202.4	121.3	286	245.3	147.0
37	31.7	19.0	87	74.6	44.7	37	117.5	70.4	87	160.4	96.1	37	203.3	121.8	87	246.2	147.5
38	32.6	19.5	88	75.5	45.2	38	118.4	70.9	88	161.2	96.6	38	204.1	122.3	88	247.0	148.0
39	33.5	20.0	89	76.3	45.7	39	119.2	71.4	89	162.1	97.1	39	205.0	122.8	89	247.9	148.6
40	34.3	20.6	90	77.2	46.3	40	120.1	72.0	90	163.0	97.6	40	205.8	123.3	90	248.7	149.0
41	35.2	21.1	91	78.1	46.8	141	120.9	72.5	191	163.8	98.2	241	206.7	123.9	291	249.6	149.6
42	36.0	21.6	92	78.9	47.3	42	121.8	73.0	92	164.7	98.7	42	207.6	124.4	92	250.4	150.1
43	36.9	22.1	93	79.8	47.8	43	122.7	73.5	93	165.5	99.2	43	208.4	124.9	93	251.3	150.6
44	37.7	22.6	94	80.6	48.3	44	123.5	74.0	94	166.4	99.7	44	209.3	125.4	94	252.2	151.1
45	38.6	23.1	95	81.5	48.8	45	124.4	74.6	95	167.3	100.2	45	210.1	125.9	95	253.0	151.6
46	39.5	23.6	96	82.3	49.3	146	125.2	75.0	196	168.1	100.7	246	211.0	126.4	296	253.9	152.1
47	40.3	24.2	97	83.2	49.9	47	126.1	75.6	97	169.0	101.2	47	211.9	126.9	97	254.7	152.6
48	41.2	24.7	98	84.1	50.4	48	126.9	76.1	98	169.8	101.8	48	212.7	127.4	98	255.6	153.2
49	42.0	25.2	99	84.9	50.9	49	127.8	76.6	99	170.7	102.3	49	213.6	128.0	99	256.5	153.7
50	42.9	25.7	100	85.8	51.4	150	128.7	77.1	200	171.5	102.8	250	214.4	128.5	300	257.3	154.2
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $5\frac{1}{4}$  Points.



# Difference of Latitude and Departure for 3 Points.

69

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.8	00.6	51	42.4	28.3	101	84.0	56.1	151	125.5	83.9	201	167.1	111.7	251	208.7	139.4
2	01.7	01.1	52	43.2	28.9	02	84.8	56.7	52	126.4	84.4	02	167.9	112.2	52	209.5	140.0
3	02.5	01.7	53	44.1	29.4	03	85.6	57.2	53	127.2	85.0	03	168.8	112.8	53	210.5	140.5
4	03.3	02.2	54	44.9	30.0	04	86.5	57.8	54	128.0	85.5	04	169.6	113.3	54	211.2	141.1
5	04.2	02.8	55	45.7	30.6	05	87.3	58.3	55	128.9	86.1	05	170.4	113.9	55	212.0	141.7
6	05.0	03.3	56	46.6	31.1	06	88.1	58.9	56	129.7	86.7	06	171.3	114.4	56	212.8	142.2
7	05.8	03.9	57	47.4	31.7	07	89.0	59.4	57	130.5	87.2	07	172.1	115.0	57	213.7	142.8
8	06.7	04.4	58	48.2	32.2	08	89.8	60.0	58	131.4	87.8	08	172.9	115.5	58	214.5	143.3
9	07.5	05.0	59	49.1	32.8	09	90.6	60.5	59	132.2	88.3	09	173.8	116.1	59	215.3	143.9
10	08.3	05.6	60	49.9	33.3	10	91.4	61.1	60	133.0	88.6	10	174.6	116.7	60	216.1	144.4
11	09.1	06.1	61	50.7	33.9	11	92.3	61.7	61	133.8	89.4	11	175.4	117.2	61	217.0	145.0
12	10.0	06.7	62	51.5	34.4	12	93.1	62.2	62	134.7	90.0	12	176.2	117.8	62	217.8	145.5
13	10.8	07.2	63	52.4	35.0	13	93.9	62.8	63	135.5	90.5	13	177.1	118.3	63	218.6	146.1
14	11.6	07.8	64	53.2	35.6	14	94.8	63.3	64	136.3	91.1	14	177.9	118.9	64	219.5	146.7
15	12.5	08.3	65	54.0	36.1	15	95.6	63.9	65	137.2	91.7	15	178.7	119.4	65	220.3	147.2
16	13.3	08.9	66	54.9	36.7	16	96.4	64.4	66	138.0	92.2	16	179.6	120.0	66	221.1	147.8
17	14.1	09.4	67	55.7	37.2	17	97.3	65.0	67	138.8	92.8	17	180.4	120.5	67	222.0	148.3
18	15.0	10.0	68	56.5	37.8	18	98.1	65.5	68	139.7	93.3	18	181.2	121.1	68	222.8	148.9
19	15.8	10.6	69	57.4	38.3	19	98.9	66.1	69	140.5	93.9	19	182.1	121.7	69	223.6	149.4
20	16.6	11.1	70	58.2	38.9	20	99.8	66.7	70	141.3	94.4	20	182.9	122.2	70	224.5	150.0
21	17.5	11.7	71	59.0	39.4	21	100.6	67.2	71	142.2	95.0	21	183.7	122.8	71	225.3	150.5
22	18.3	12.2	72	59.9	40.0	22	101.4	67.8	72	143.0	95.5	22	184.6	123.3	72	226.1	151.1
23	19.1	12.8	73	60.7	40.6	23	102.3	68.3	73	143.8	96.1	23	185.4	123.9	73	227.0	151.7
24	20.0	13.3	74	61.5	41.1	24	103.1	68.9	74	144.7	96.7	24	186.2	124.4	74	227.8	152.2
25	20.8	13.9	75	62.4	41.7	25	103.9	69.4	75	145.5	97.2	25	187.1	125.0	75	228.6	152.8
26	21.6	14.4	76	63.2	42.2	26	104.8	70.0	76	146.3	97.8	26	187.9	125.5	76	229.4	153.3
27	22.4	15.0	77	64.0	42.8	27	105.6	70.5	77	147.1	98.3	27	188.7	126.1	77	230.3	153.9
28	23.3	15.6	78	64.8	43.3	28	106.4	71.1	78	148.0	98.9	28	189.5	126.7	78	231.1	154.4
29	24.1	16.1	79	65.7	43.9	29	107.2	71.7	79	148.8	99.4	29	190.4	127.2	79	231.9	155.0
30	24.9	16.7	80	66.5	44.4	30	108.1	72.2	80	149.6	100.0	30	191.2	127.8	80	232.8	155.5
31	25.8	17.2	81	67.3	45.0	31	108.9	72.8	81	150.5	100.5	31	192.0	128.3	81	233.6	156.1
32	26.6	17.8	82	68.2	45.6	32	109.7	73.3	82	151.3	101.1	32	192.9	128.9	82	234.4	156.7
33	27.4	18.3	83	69.0	46.1	33	110.6	73.9	83	152.1	101.7	33	193.7	129.4	83	235.3	157.2
34	28.3	18.9	84	69.8	46.7	34	111.4	74.4	84	153.0	102.2	34	194.5	130.0	84	236.1	157.8
35	29.1	19.4	85	70.7	47.2	35	112.2	75.0	85	153.8	102.8	35	195.4	130.5	85	236.9	158.3
36	29.9	20.0	86	71.5	47.8	36	113.1	75.5	86	154.6	103.3	36	196.2	131.1	86	237.8	158.9
37	30.8	20.6	87	72.3	48.3	37	113.9	76.1	87	155.5	103.9	37	197.0	131.7	87	238.6	159.4
38	31.6	21.1	88	73.2	48.9	38	114.7	76.7	88	156.3	104.4	38	197.9	132.2	88	239.4	160.0
39	32.4	21.7	89	74.0	49.4	39	115.6	77.2	89	157.1	105.0	39	198.7	132.8	89	240.3	160.5
40	33.3	22.2	90	74.8	50.0	40	116.4	77.8	90	158.0	105.5	40	199.5	133.3	90	241.1	161.1
41	34.1	22.8	91	75.7	50.6	41	117.2	78.3	91	158.8	106.1	41	200.4	133.9	91	241.9	161.7
42	34.9	23.3	92	76.5	51.1	42	118.1	78.9	92	159.6	106.7	42	201.2	134.4	92	242.8	162.2
43	35.8	23.9	93	77.3	51.7	43	118.9	79.4	93	160.4	107.2	43	202.0	135.0	93	243.6	162.8
44	36.6	24.4	94	78.1	52.2	44	119.7	80.0	94	161.3	107.8	44	202.8	135.5	94	244.4	163.3
45	37.4	25.0	95	79.0	52.8	45	120.5	80.5	95	162.1	108.3	45	203.7	136.1	95	245.2	163.9
46	38.2	25.6	96	79.8	53.3	46	121.4	81.1	96	162.9	108.9	46	204.5	136.7	96	246.2	164.4
47	39.1	26.1	97	80.6	53.9	47	122.2	81.7	97	163.8	109.4	47	205.3	137.2	97	246.9	165.0
48	39.9	26.7	98	81.5	54.4	48	123.0	82.2	98	164.6	110.0	48	206.2	137.8	98	247.7	165.5
49	40.7	27.2	99	82.3	55.0	49	123.9	82.8	99	165.4	110.5	49	207.0	138.3	99	248.5	166.1
50	41.6	27.8	100	83.1	55.6	50	124.7	83.3	100	166.3	111.1	50	207.8	138.9	100	249.4	166.7
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

U

for 5 Points.

70 Difference of Latitude and Departure for  $3\frac{1}{4}$  Points.

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	51	41.0	30.4	101	81.1	60.2	151	121.3	90.0	201	161.4	119.7	251	201.6	149.5
2	01.6	01.2	52	41.8	31.0	02	81.9	60.8	52	122.1	90.6	02	162.2	120.3	52	202.4	150.1
3	02.4	01.8	53	42.6	31.6	03	82.7	61.4	53	122.9	91.1	03	163.0	120.9	53	203.2	150.7
4	03.2	02.4	54	43.4	32.2	04	83.5	62.0	54	123.7	91.7	04	163.8	121.5	54	204.0	151.3
5	04.0	03.0	55	44.2	32.8	05	84.3	62.6	55	124.5	92.3	05	164.6	122.1	55	204.8	151.9
6	04.8	03.6	56	45.0	33.4	06	85.1	63.1	56	125.3	92.9	06	165.4	122.7	56	205.6	152.5
7	05.6	04.2	57	45.8	34.0	07	85.9	63.7	57	126.1	93.5	07	166.2	123.3	57	206.4	153.1
8	06.4	04.8	58	46.6	34.6	08	86.7	64.3	58	126.9	94.1	08	167.0	123.9	58	207.2	153.7
9	07.2	05.4	59	47.4	35.1	09	87.5	64.9	59	127.7	94.7	09	167.8	124.5	59	208.0	154.3
10	08.0	06.0	60	48.2	35.7	10	88.3	65.5	60	128.5	95.3	10	168.6	125.1	60	208.8	154.9
11	08.8	06.6	61	49.0	36.3	11	89.1	66.1	61	129.3	95.9	11	169.4	125.7	61	209.6	155.5
12	09.6	07.1	62	49.8	36.9	12	89.9	66.7	62	130.1	96.5	12	170.2	126.3	62	210.4	156.1
13	10.4	07.7	63	50.6	37.5	13	90.7	67.3	63	130.9	97.1	13	171.0	126.9	63	211.2	156.7
14	11.2	08.3	64	51.4	38.1	14	91.5	67.9	64	131.7	97.7	14	171.8	127.5	64	212.0	157.3
15	12.0	08.9	65	52.2	38.7	15	92.4	68.5	65	132.5	98.3	15	172.7	128.1	65	212.8	157.9
16	12.8	09.5	66	53.0	39.3	16	93.2	69.1	66	133.3	98.9	16	173.5	128.7	66	213.6	158.1
17	13.7	10.1	67	53.8	39.9	17	94.0	69.7	67	134.1	99.5	17	174.3	129.3	67	214.4	159.1
18	14.5	10.7	68	54.6	40.5	18	94.8	70.3	68	134.9	100.1	18	175.1	129.9	68	215.2	159.7
19	15.1	11.3	69	55.4	41.1	19	95.6	70.9	69	135.7	100.7	19	175.9	130.5	69	216.0	160.5
20	16.3	11.9	70	56.2	41.7	20	96.4	71.5	70	136.5	101.3	20	176.7	131.1	70	216.8	160.9
21	16.6	12.5	71	57.0	42.3	21	97.2	72.1	71	137.3	101.9	21	177.5	131.7	71	217.6	161.4
22	17.7	13.1	72	57.8	42.9	22	98.0	72.7	72	138.1	102.5	22	178.3	132.3	72	218.4	162.0
23	18.5	13.7	73	58.6	43.5	23	98.8	73.3	73	138.9	103.1	23	179.1	132.9	73	219.2	162.6
24	19.3	14.3	74	59.4	44.1	24	99.6	73.9	74	139.7	103.7	24	179.9	133.4	74	220.0	163.2
25	20.1	14.9	75	60.2	44.7	25	100.4	74.5	75	140.5	104.3	25	180.7	134.0	75	220.8	163.8
26	20.9	15.5	76	61.0	45.3	26	101.2	75.1	76	141.3	104.9	26	181.5	134.6	76	221.6	164.4
27	21.7	16.1	77	61.8	45.9	27	102.0	75.7	77	142.1	105.4	27	182.3	135.2	77	222.4	165.0
28	22.5	16.7	78	62.6	46.5	28	102.8	76.3	78	142.9	106.0	28	183.1	135.8	78	223.2	165.6
29	23.3	17.3	79	63.4	47.1	29	103.6	76.9	79	143.7	106.6	29	183.9	136.4	79	224.0	166.2
30	24.1	17.9	80	64.2	47.7	30	104.4	77.4	80	144.5	107.2	30	184.7	137.0	80	224.8	166.8
31	24.9	18.5	81	65.0	48.3	31	105.2	78.0	81	145.4	107.8	31	185.5	137.6	81	225.7	167.4
32	25.7	19.1	82	65.8	48.9	32	106.0	78.6	82	146.2	108.4	32	186.3	138.2	82	226.5	168.0
33	26.5	19.7	83	66.7	49.4	33	106.8	79.2	83	147.0	109.0	33	187.1	138.8	83	227.3	168.6
34	27.3	20.3	84	67.5	50.0	34	107.6	79.8	84	147.8	109.6	34	187.9	139.4	84	228.1	169.2
35	28.1	20.9	85	68.3	50.6	35	108.4	80.4	85	148.6	110.2	35	188.7	140.0	85	228.9	169.8
36	28.9	21.4	86	69.1	51.2	36	109.2	81.0	86	149.4	110.8	36	189.5	140.6	86	229.7	170.4
37	29.7	22.0	87	69.9	51.8	37	110.0	81.6	87	150.2	111.4	37	190.3	141.2	87	230.5	171.0
38	30.5	22.6	88	70.7	52.4	38	110.8	82.2	88	151.0	112.0	38	191.1	141.8	88	231.3	171.6
39	31.3	23.2	89	71.5	53.0	39	111.6	82.8	89	151.8	112.6	39	191.9	142.4	89	232.1	172.2
40	32.1	23.8	90	72.3	53.6	40	112.4	83.4	90	152.6	113.2	40	192.7	143.0	90	232.9	172.8
41	32.9	24.4	91	73.1	54.2	41	113.2	84.0	91	153.4	113.8	41	193.5	143.6	91	233.7	173.4
42	33.7	25.0	92	73.9	54.8	42	114.0	84.6	92	154.2	114.4	42	194.3	144.2	92	234.5	174.0
43	34.5	25.6	93	74.7	55.4	43	114.8	85.2	93	155.0	115.0	43	195.1	144.8	93	235.3	174.6
44	35.3	26.2	94	75.5	56.0	44	115.6	85.8	94	155.8	115.6	44	195.9	145.4	94	236.1	175.1
45	36.1	26.8	95	76.3	56.6	45	116.4	86.4	95	156.6	116.2	45	196.7	146.0	95	236.9	175.7
46	36.9	27.4	96	77.1	57.2	46	117.2	87.0	96	157.4	116.8	46	197.5	146.6	96	237.7	176.3
47	37.7	28.0	97	77.9	57.8	47	118.0	87.6	97	158.2	117.4	47	198.4	147.1	97	238.5	176.9
48	38.5	28.6	98	78.7	58.4	48	118.8	88.2	98	159.0	118.0	48	199.2	147.7	98	239.3	177.5
49	39.4	29.2	99	79.5	59.0	49	119.7	88.8	99	159.8	118.6	49	200.0	148.3	99	240.1	178.1
50	40.2	29.8	100	80.3	59.6	50	120.5	89.4	100	160.6	119.1	50	220.8	148.9	300	240.9	178.7
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $4\frac{1}{4}$  Points.



# Difference of Latitude and Departure for 3 1/2 Points. 71

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.8	00.6	2	01.5	01.3	3	02.3	01.9	4	03.1	02.5	5	03.9	03.2	6	04.6	03.8
7	05.4	04.4	8	06.2	05.1	9	07.0	05.7	10	07.7	06.3	11	08.5	07.0	12	09.3	07.6
13	10.1	08.2	14	10.8	08.9	15	11.6	09.5	16	12.4	10.1	17	13.1	10.8	18	13.9	11.4
19	14.7	12.0	20	15.5	12.7	21	16.2	13.3	22	17.0	14.0	23	17.8	14.6	24	18.5	15.2
25	19.3	15.9	26	20.1	16.5	27	20.9	17.1	28	21.6	17.8	29	22.4	18.4	30	23.2	19.0
31	24.0	19.7	32	24.7	20.3	33	25.5	20.9	34	26.3	21.6	35	27.1	22.2	36	27.8	22.8
37	28.6	23.5	38	29.4	24.1	39	30.1	24.7	40	30.9	25.4	41	31.7	26.0	42	32.5	26.6
43	33.2	27.3	44	34.0	27.9	45	34.8	28.5	46	35.6	29.2	47	36.3	29.8	48	37.1	30.4
49	37.9	31.1	50	38.6	31.7	101	78.1	64.0	102	78.8	64.7	103	79.6	65.3	104	80.4	66.0
						105	81.1	66.6	106	81.9	67.2	107	82.7	67.9	108	83.5	68.5
						109	84.2	69.1	110	85.0	69.8	111	85.8	70.4	112	86.6	71.0
						113	87.3	71.7	114	88.1	72.3	115	88.9	72.9	116	89.6	73.6
						117	90.4	74.2	118	91.2	74.8	119	92.0	75.5	120	92.7	76.1
						121	93.5	76.7	122	94.3	77.4	123	95.1	78.0	124	95.8	78.6
						125	96.6	79.3	126	97.4	79.9	127	98.1	80.5	128	98.9	81.2
						129	99.7	81.8	130	100.5	82.4	131	101.2	83.1	132	102.0	83.7
						133	102.8	84.3	134	103.6	85.0	135	104.3	85.6	136	105.1	86.2
						137	105.9	86.9	138	106.6	87.5	139	107.4	88.1	140	108.2	88.8
						141	109.0	89.4	142	109.7	90.0	143	110.5	90.7	144	111.3	91.3
						145	112.1	92.0	146	112.8	92.6	147	113.6	93.2	148	114.4	93.9
						149	115.1	94.5	150	115.9	95.1	151	116.7	95.8	152	117.5	96.4
						153	118.2	97.0	154	119.0	97.7	155	119.8	98.3	156	120.6	98.9
						157	121.3	99.6	158	122.1	100.2	159	122.9	100.8	160	123.6	101.5
						161	124.4	102.1	162	125.2	102.7	163	126.0	103.4	164	126.7	104.0
						165	127.5	104.6	166	128.3	105.3	167	129.1	105.9	168	129.8	106.5
						169	130.6	107.2	170	131.4	107.8	171	132.1	108.4	172	132.9	109.1
						173	133.7	109.7	174	134.5	110.3	175	135.2	111.0	176	136.0	111.6
						177	136.8	112.2	178	137.6	112.9	179	138.3	113.5	180	139.1	114.1
						181	139.9	114.8	182	140.6	115.4	183	141.4	116.0	184	142.2	116.7
						185	143.0	117.3	186	143.7	118.0	187	144.5	118.6	188	145.3	119.2
						189	146.1	119.9	190	146.8	120.5	191	147.6	121.1	192	148.4	121.8
						193	149.1	122.4	194	149.9	123.0	195	150.7	123.7	196	151.5	124.3
						197	152.2	125.2	198	153.0	125.9	199	153.8	126.6	200	154.6	127.3
						201	155.4	128.1	202	156.2	128.8	203	157.0	129.5	204	157.8	130.2
						205	158.6	130.9	206	159.4	131.6	207	160.2	132.3	208	161.0	133.0
						209	161.8	133.7	210	162.6	134.4	211	163.4	135.1	212	164.2	135.8
						213	165.2	136.5	214	166.0	137.2	215	166.8	137.9	216	167.6	138.6
						217	168.4	139.3	218	169.2	140.0	219	170.0	140.7	220	170.8	141.4
						221	171.6	142.7	222	172.4	143.4	223	173.2	144.1	224	174.0	144.8
						225	174.8	145.5	226	175.6	146.2	227	176.4	146.9	228	177.2	147.6
						229	178.0	148.3	230	178.8	149.0	231	179.6	149.7	232	180.4	150.4
						233	180.2	151.1	234	181.0	151.8	235	181.8	152.5	236	182.6	153.2
						237	182.6	153.9	238	183.4	154.4	239	184.0	154.9	240	184.6	155.4
						241	185.2	156.0	242	185.8	156.6	243	186.4	157.1	244	187.0	157.6
						245	187.6	158.2	246	188.2	158.8	247	188.8	159.4	248	189.4	160.0
						249	190.0	160.6	250	190.6	161.2	251	191.2	161.8	252	191.8	162.4
						253	192.4	162.4	254	193.0	163.0	255	193.6	163.6	256	194.2	164.2
						257	194.8	164.8	258	195.4	165.4	259	196.0	166.0	260	196.6	166.6
						261	197.2	167.2	262	197.8	167.8	263	198.4	168.4	264	199.0	169.0
						265	199.6	169.6	266	200.2	170.2	267	200.8	170.8	268	201.4	171.4
						269	202.0	172.0	270	202.6	172.6	271	203.2	173.2	272	203.8	173.8
						273	204.4	174.4	274	205.0	175.0	275	205.6	175.6	276	206.2	176.2
						277	206.8	176.8	278	207.4	177.4	279	208.0	178.0	280	208.6	178.6
						281	209.2	179.2	282	209.8	179.8	283	210.4	180.4	284	211.0	181.0
						285	211.6	181.6	286	212.2	182.2	287	212.8	182.8	288	213.4	183.4
						289	214.0	184.0	290	214.6	184.6	291	215.2	185.2	292	215.8	185.8
						293	216.4	186.4	294	217.0	187.0	295	217.6	187.6	296	218.2	188.2
						297	218.8	188.8	298	219.4	189.4	299	220.0	190.0	300	220.6	190.6
						301	221.2	191.2	302	221.8	191.8	303	222.4	192.4	304	223.0	193.0
						305	223.6	193.6	306	224.2	194.2	307	224.8	194.8	308	225.4	195.4
						309	226.0	196.0	310	226.6	196.6	311	227.2	197.2	312	227.8	197.8
						313	228.4	198.4	314	229.0	199.0	315	229.6	199.6	316	230.2	200.2
						317	230.8	200.8	318	231.4	201.4	319	232.0	202.0	320	232.6	202.6
						321	233.2	203.2	322	233.8	203.8	323	234.4	204.4	324	235.0	205.0
						325	235.6	205.6	326	236.2	206.2	327	236.8	206.8	328	237.4	207.4
						329	238.0	208.0	330	238.6	208.6	331	239.2	209.2	332	239.8	209.8
						333	240.4	210.4	334	241.0	211.0	335	241.6	211.6	336	242.2	212.2
						337	242.8	212.8	338	243.4	213.4	339	244.0	214.0	340	244.6	214.6
						341	245.2	215.2	342	245.8	215.8	343	246.4	216.4	344	247.0	217.0
						345	247.6	217.6	346	248.2	218.2	347	248.8	218.8	348	249.4	219.4
						349	250.0	219.4	350	250.6	220.0	351	251.2	220.6	352	251.8	221.2
						353	252.4	221.2	354	253.0	221.8	355	253.6	222.4	356	254.2	223.0
						357	254.8	223.2	358	255.4	223.8	359	256.0	224.4	360	256.6	225.0
						361	257.2	225.2	362	257.8	225.8	363	258.4	226.4	364	259.0	227.0
						365	259.6	227.2	366	260.2	227.8	367	260.8	228.4	368	261.4	229.0
						369	262.0	229.0	370	262.6	229.6	371	263.2	230.2	372	263.8	230.8
						373	264.4	231.2	374	265.0	231.8	375	265.6	232.4	376	266.2	233.0
						377	266.8	233.2	378	267.4	233.8	379	268.0	234.4	380	268.6	235.0
						381	269.2	235.2	382	269.8	235.8	383	270.4	236.4	384	271.0	237.0
						385	271.6	237.2	386	272.2	237.8	387	272.8	238.4	388	273.4	239.0
						389	274.0	239.2	390	274.6	239.8	391	275.2	240.4	392	275.8	241.0
						393	276.4	241.2	394	277.0	241.8	395	277.6	242.4	396	278.2	243.0
						397	278.8	243.2	398	279.4	243.8	399	280.0	244.4	400	280.6	245.0
						401	281.2	245.2	402	281.8	245.8	403	282.4	246.4	404	283.0	247.0
						405	283.6	247.2	406	284.2	247.8	407	284.8	248.4	408	285.4	249.0
						409	286.0	249.2	410	286.6	249.8	411	287.2	250.4	412	287.8	251.0

Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep	Dist	Lat	Dep
1	00.7	00.7	51	37.8	34.2	101	74.8	67.8	151	111.9	101.4	201	148.9	135.0	251	185.9	168.5
2	01.5	01.3	52	38.5	34.9	02	75.6	68.5	52	112.6	102.1	02	149.6	135.6	52	186.7	169.2
3	02.2	02.0	53	39.3	35.6	03	76.3	69.2	53	113.3	102.7	03	150.4	136.3	53	187.4	169.9
4	03.0	02.7	54	40.0	36.3	04	77.0	69.8	54	114.1	103.4	04	151.1	137.0	54	188.2	170.5
5	03.7	03.4	55	40.7	36.9	05	77.8	70.5	55	114.8	104.1	05	151.9	137.6	55	188.9	171.2
6	04.4	04.0	56	41.5	37.6	06	78.5	71.2	56	115.6	104.7	06	152.6	138.3	256	189.6	171.9
7	05.2	04.7	57	42.2	38.3	07	79.3	71.8	57	116.3	105.4	07	153.3	139.0	57	190.4	172.6
8	05.9	05.4	58	43.0	38.9	08	80.0	72.5	58	117.0	106.1	08	154.1	139.7	58	191.1	173.2
9	06.7	06.0	59	43.7	39.6	09	80.7	73.2	59	117.8	106.8	09	154.8	140.3	59	191.9	173.9
10	07.4	06.7	60	44.4	40.3	10	81.5	73.9	60	118.5	107.4	10	155.6	141.0	60	192.6	174.6
11	08.2	07.4	61	45.2	41.0	11	82.2	74.5	61	119.3	108.1	11	156.3	141.7	261	193.3	175.2
12	08.9	08.1	62	45.9	41.6	12	83.0	75.2	62	120.0	108.8	12	157.0	142.3	62	194.1	175.9
13	09.6	08.7	63	46.7	42.3	13	83.7	75.9	63	120.7	109.4	13	157.8	143.0	63	194.8	176.6
14	10.4	09.4	64	47.4	43.0	14	84.4	76.5	64	121.5	110.1	14	158.5	143.7	64	195.6	177.3
15	11.1	10.1	65	48.2	43.6	15	85.2	77.2	65	122.2	110.8	15	159.3	144.4	65	196.3	177.9
16	11.9	10.7	66	48.9	44.3	16	85.9	77.9	66	123.0	111.5	216	160.0	145.0	266	197.0	178.6
17	12.6	11.4	67	49.6	45.0	17	86.7	78.6	67	123.7	112.1	17	160.7	145.7	67	197.8	179.3
18	13.3	12.1	68	50.4	45.7	18	87.4	79.2	68	124.4	112.8	18	161.5	146.4	68	198.5	179.9
19	14.1	12.8	69	51.1	46.3	19	88.2	79.9	69	125.2	113.5	19	162.2	147.0	69	199.3	180.6
20	14.8	13.4	70	51.9	47.0	20	88.9	80.6	70	125.9	114.1	20	163.7	147.7	70	200.0	181.3
21	15.6	14.1	71	52.6	47.7	21	89.6	81.2	71	126.7	114.8	221	163.7	148.4	271	200.7	182.0
22	16.3	14.8	72	53.3	48.3	22	90.4	81.9	72	127.4	115.5	22	164.4	149.1	72	201.5	182.6
23	17.0	15.4	73	54.1	49.0	23	91.1	82.6	73	128.2	116.2	23	165.2	149.7	73	202.2	183.3
24	17.8	16.1	74	54.8	49.7	24	91.9	83.3	74	128.9	116.8	24	165.9	150.4	74	203.0	184.0
25	18.5	16.8	75	55.6	50.4	25	92.6	83.9	75	129.6	117.5	25	166.7	151.1	75	203.7	184.6
26	19.3	17.5	76	56.3	51.0	26	93.3	84.6	76	130.4	118.2	226	167.4	151.7	276	204.4	185.3
27	20.0	18.1	77	57.0	51.7	27	94.1	85.3	77	131.1	118.8	27	168.2	152.4	77	205.2	186.0
28	20.7	18.8	78	57.8	52.4	28	94.8	85.9	78	131.9	119.5	28	168.9	153.1	78	205.9	186.7
29	21.5	19.5	79	58.5	53.0	29	95.6	86.6	79	132.6	120.2	29	169.6	153.8	79	206.7	187.3
30	22.2	20.1	80	59.3	53.7	30	96.3	87.3	80	133.3	120.9	30	170.4	154.4	80	207.4	188.0
31	23.0	20.8	81	60.0	54.4	31	97.0	88.0	81	134.1	121.5	231	171.1	155.1	281	208.2	188.7
32	23.7	21.5	82	60.7	55.1	32	97.8	88.6	82	134.8	122.2	32	171.9	155.8	82	208.9	189.3
33	24.4	22.2	83	61.5	55.7	33	98.5	89.3	83	135.6	123.0	33	172.6	156.4	83	209.6	190.0
34	25.2	22.8	84	62.2	56.4	34	99.3	90.0	84	136.3	123.5	34	173.3	157.1	84	210.4	190.7
35	25.9	23.5	85	63.0	57.1	35	100.0	90.6	85	137.0	124.2	35	174.1	157.8	85	211.1	191.4
36	26.7	24.2	86	63.7	57.7	36	100.7	91.3	86	137.8	124.9	236	174.8	158.5	286	211.9	192.0
37	27.4	24.8	87	64.4	58.4	37	101.5	92.0	87	138.5	125.6	37	175.6	159.1	87	212.6	192.7
38	28.2	25.5	88	65.2	59.1	38	102.2	92.7	88	139.3	126.2	38	176.3	159.8	88	213.3	193.4
39	28.9	26.2	89	65.9	59.8	39	103.0	93.3	89	140.0	126.9	39	177.0	160.5	89	214.1	194.0
40	29.6	26.9	90	66.7	60.4	40	103.7	94.0	90	140.7	127.6	40	177.8	161.1	90	214.8	194.7
41	30.4	27.5	91	67.4	61.1	41	104.4	94.7	91	141.5	128.2	241	178.5	161.8	291	215.6	195.4
42	31.1	28.2	92	68.2	61.8	42	105.2	95.3	92	142.2	128.9	42	179.3	162.5	92	216.3	196.1
43	31.9	28.9	93	68.9	62.4	43	105.9	96.0	93	143.0	129.6	43	180.0	163.2	93	217.0	196.7
44	32.6	29.5	94	69.6	63.1	44	106.7	96.7	94	143.7	130.3	44	180.7	163.8	94	217.8	197.4
45	33.3	30.2	95	70.4	63.8	45	107.4	97.4	95	144.4	130.9	45	181.5	164.5	95	218.5	198.1
46	34.1	30.9	96	71.1	64.5	46	108.2	98.0	96	145.2	131.6	246	182.2	165.2	296	219.3	198.7
47	34.8	31.6	97	71.9	65.1	47	108.9	98.7	97	145.9	132.3	47	183.0	165.8	97	220.0	199.4
48	35.6	32.2	98	72.6	65.8	48	109.6	99.4	98	146.7	132.9	48	183.7	166.5	98	220.7	200.1
49	36.3	32.9	99	73.3	66.5	49	110.4	100.0	99	147.4	133.6	49	184.4	167.2	99	221.5	200.8
50	37.0	33.6	100	74.1	67.1	50	111.1	100.7	200	148.2	134.3	250	185.2	167.9	300	222.2	201.4
Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat	Dist	Dep	Lat

for  $4\frac{1}{4}$  Points.



# Difference of Latitude and Departure for 4 Points.

73

Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.	Dist.	Lat.	Dep.
1	00.7	00.7	51	36.1	36.1	101	71.4	71.4	151	106.8	106.8	201	142.1	142.1	251	177.5	177.5
2	01.4	01.4	52	36.8	36.8	02	72.1	72.1	52	107.5	107.5	02	142.8	142.8	52	178.2	178.2
3	02.1	02.1	53	37.5	37.5	03	72.8	72.8	53	108.2	108.2	03	143.5	143.5	53	178.9	178.9
4	02.8	02.8	54	38.2	38.2	04	73.5	73.5	54	108.9	108.9	04	144.2	144.2	54	179.6	179.6
5	03.5	03.5	55	38.9	38.9	05	74.2	74.2	55	109.6	109.6	05	144.9	144.9	55	180.3	180.3
6	04.2	04.2	56	39.6	39.6	106	74.9	74.9	156	110.3	110.3	206	145.7	145.7	256	181.0	181.0
7	04.9	04.9	57	40.3	40.3	07	75.7	75.7	57	111.0	111.0	07	146.4	146.4	57	181.7	181.7
8	05.7	05.7	58	41.0	41.0	08	76.4	76.4	58	111.7	111.7	08	147.1	147.1	58	182.4	182.4
9	06.4	06.4	59	41.7	41.7	09	77.1	77.1	59	112.4	112.4	09	147.8	147.8	59	183.1	183.1
10	07.1	07.1	60	42.4	42.4	10	77.8	77.8	60	113.1	113.1	10	148.5	148.5	60	183.8	183.8
11	07.8	07.8	61	43.1	43.1	111	78.5	78.5	161	113.8	113.8	211	149.2	149.2	261	184.5	184.5
12	08.5	08.5	62	43.8	43.8	12	79.2	79.2	62	114.5	114.5	12	149.9	149.9	62	185.3	185.3
13	09.2	09.2	63	44.5	44.5	13	79.9	79.9	63	115.3	115.3	13	150.6	150.6	63	186.0	186.0
14	09.9	09.9	64	45.3	45.3	14	80.6	80.6	64	116.0	116.0	14	151.3	151.3	64	186.7	186.7
15	10.6	10.6	65	46.0	46.0	15	81.3	81.3	65	116.7	116.7	15	152.0	152.0	65	187.4	187.4
16	11.3	11.3	66	46.7	46.7	116	82.0	82.0	166	117.4	117.4	216	152.7	152.7	266	188.1	188.1
17	12.0	12.0	67	47.4	47.4	17	82.7	82.7	67	118.1	118.1	17	153.4	153.4	67	188.8	188.8
18	12.7	12.7	68	48.1	48.1	18	83.4	83.4	68	118.8	118.8	18	154.1	154.1	68	189.5	189.5
19	13.4	13.4	69	48.8	48.8	19	84.1	84.1	69	119.5	119.5	19	154.8	154.8	69	190.2	190.2
20	14.1	14.1	70	49.5	49.5	20	84.8	84.8	70	120.2	120.2	20	155.6	155.6	70	190.9	190.9
21	14.8	14.8	71	50.2	50.2	121	85.6	85.6	171	120.9	120.9	221	156.3	156.3	271	191.6	191.6
22	15.6	15.6	72	50.9	50.9	22	86.3	86.3	72	121.6	121.6	22	157.0	157.0	72	192.3	192.3
23	16.3	16.3	73	51.6	51.6	23	87.0	87.0	73	122.3	122.3	23	157.7	157.7	73	193.0	193.0
24	17.0	17.0	74	52.3	52.3	24	87.7	87.7	74	123.0	123.0	24	158.4	158.4	74	193.7	193.7
25	17.7	17.7	75	53.0	53.0	25	88.4	88.4	75	123.7	123.7	25	159.1	159.1	75	194.4	194.4
26	18.4	18.4	76	53.7	53.7	126	89.1	89.1	176	124.4	124.4	226	159.8	159.8	276	195.2	195.2
27	19.1	19.1	77	54.4	54.4	27	89.8	89.8	77	125.2	125.2	27	160.5	160.5	77	195.9	195.9
28	19.8	19.8	78	55.2	55.2	28	90.5	90.5	78	125.9	125.9	28	161.2	161.2	78	196.6	196.6
29	20.5	20.5	79	55.9	55.9	29	91.2	91.2	79	126.6	126.6	29	161.9	161.9	79	197.3	197.3
30	21.2	21.2	80	56.6	56.6	30	91.9	91.9	80	127.3	127.3	30	162.6	162.6	80	198.0	198.0
31	21.9	21.9	81	57.3	57.3	131	92.6	92.6	181	128.0	128.0	231	163.3	163.3	281	198.7	198.7
32	22.6	22.6	82	58.0	58.0	32	93.3	93.3	82	128.7	128.7	32	164.0	164.0	82	199.4	199.4
33	23.3	23.3	83	58.7	58.7	33	94.0	94.0	83	129.4	129.4	33	164.7	164.7	83	200.1	200.1
34	24.0	24.0	84	59.4	59.4	34	94.7	94.7	84	130.1	130.1	34	165.5	165.5	84	200.8	200.8
35	24.7	24.7	85	60.1	60.1	35	95.5	95.5	85	130.8	130.8	35	166.2	166.2	85	201.5	201.5
36	25.5	25.5	86	60.8	60.8	136	96.2	96.2	186	131.5	131.5	236	166.9	166.9	286	202.2	202.2
37	26.2	26.2	87	61.5	61.5	37	96.9	96.9	87	132.2	132.2	37	167.6	167.6	87	202.9	202.9
38	26.9	26.9	88	62.2	62.2	38	97.6	97.6	88	132.9	132.9	38	168.3	168.3	88	203.6	203.6
39	27.6	27.6	89	62.9	62.9	39	98.3	98.3	89	133.6	133.6	39	169.0	169.0	89	204.3	204.3
40	28.3	28.3	90	63.6	63.6	40	99.0	99.0	90	134.3	134.3	40	169.7	169.7	90	205.1	205.1
41	29.0	29.0	91	64.3	64.3	141	99.7	99.7	191	135.1	135.1	241	170.4	170.4	291	205.8	205.8
42	29.7	29.7	92	65.1	65.1	42	100.4	100.4	92	135.8	135.8	42	171.1	171.1	92	206.5	206.5
43	30.4	30.4	93	65.8	65.8	43	101.1	101.1	93	136.5	136.5	43	171.8	171.8	93	207.2	207.2
44	31.1	31.1	94	66.5	66.5	44	101.8	101.8	94	137.2	137.2	44	172.5	172.5	94	207.9	207.9
45	31.8	31.8	95	67.2	67.2	45	102.5	102.5	95	137.9	137.9	45	173.2	173.2	95	208.6	208.6
46	32.5	32.5	96	67.9	67.9	146	103.2	103.2	196	138.6	138.6	246	173.9	173.9	296	209.3	209.3
47	33.2	33.2	97	68.6	68.6	47	103.9	103.9	97	139.3	139.3	47	174.6	174.6	97	210.0	210.0
48	33.9	33.9	98	69.3	69.3	48	104.6	104.6	98	140.0	140.0	48	175.4	175.4	98	210.7	210.7
49	34.6	34.6	99	70.0	70.0	49	105.4	105.4	99	140.7	140.7	49	176.1	176.1	99	211.4	211.4
50	35.4	35.4	100	70.7	70.7	150	106.1	106.1	200	141.4	141.4	250	176.8	176.8	300	212.1	212.1
Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.	Dist.	Dep.	Lat.

X

for 4 Points.

# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Year 1769.												
Month Days.	January	February	March	April	May	June	July	August	September	October	November	December
1	33	35	34	35	36	37	38	39	11	11	13	12
2	34	36	35	36	37	38	39	40	12	12	14	14
3	35	37	36	37	38	39	40	11	13	13	15	15
4	36	38	37	38	39	40	11	12	14	14	16	16
5	37	39	38	39	40	11	12	13	15	15	17	17
6	38	40	39	40	11	12	13	14	16	16	18	18
7	39	11	40	11	12	13	14	15	17	17	19	19
8	40	12	11	12	13	14	15	16	18	18	20	20
9	11	13	12	13	14	15	16	17	19	19	21	21
10	12	14	13	14	15	16	17	18	20	20	22	22
11	13	15	14	15	16	17	18	19	21	21	23	23
12	14	16	15	16	17	18	19	20	22	22	24	24
13	15	17	16	17	18	19	20	21	23	23	25	25
14	16	18	17	18	19	20	21	22	24	24	26	26
15	17	19	18	19	20	21	22	23	25	25	27	27
16	18	20	19	20	21	22	23	24	26	26	28	28
17	19	21	20	21	22	23	24	25	27	27	29	29
18	20	22	21	22	23	24	25	26	28	28	30	30
19	21	23	22	23	24	25	26	27	29	29	31	31
20	22	24	23	24	25	26	27	28	30	30	32	32
21	23	25	24	25	26	27	28	29	31	31	33	33
22	24	26	25	26	27	28	29	30	32	32	34	34
23	25	27	26	27	28	29	30	31	33	33	35	35
24	26	28	27	28	29	30	31	32	34	34	36	36
25	27	29	28	29	30	31	32	33	35	35	37	37
26	28	30	29	30	31	32	33	34	36	36	38	38
27	29	31	30	31	32	33	34	35	37	37	39	39
28	30	32	31	32	33	34	35	36	38	38	40	40
29	31	33	32	33	34	35	36	37	39	39	11	11
30	32	34	33	34	35	36	37	38	40	40	12	12
31	33	35	34	35	36	37	38	39	11	11	13	13

Year 1770.												
Month Days.	January	February	March	April	May	June	July	August	September	October	November	December
1	14	16	15	16	17	18	19	20	22	22	24	24
2	15	17	16	17	18	19	20	21	23	23	25	25
3	16	18	17	18	19	20	21	22	24	24	26	26
4	17	19	18	19	20	21	22	23	25	25	27	27
5	18	20	19	20	21	22	23	24	26	26	28	28
6	19	21	20	21	22	23	24	25	27	27	29	29
7	20	22	21	22	23	24	25	26	28	28	30	30
8	21	23	22	23	24	25	26	27	29	29	31	31
9	22	24	23	24	25	26	27	28	30	30	32	32
10	23	25	24	25	26	27	28	29	31	31	33	33
11	24	26	25	26	27	28	29	30	32	32	34	34
12	25	27	26	27	28	29	30	31	33	33	35	35
13	26	28	27	28	29	30	31	32	34	34	36	36
14	27	29	28	29	30	31	32	33	35	35	37	37
15	28	30	29	30	31	32	33	34	36	36	38	38
16	29	31	30	31	32	33	34	35	37	37	39	39
17	30	32	31	32	33	34	35	36	38	38	40	40
18	31	33	32	33	34	35	36	37	39	39	11	11
19	32	34	33	34	35	36	37	38	40	40	12	12
20	33	35	34	35	36	37	38	39	11	11	13	13
21	34	36	35	36	37	38	39	40	12	12	14	14
22	35	37	36	37	38	39	40	11	13	13	15	15
23	36	38	37	38	39	40	11	12	14	14	16	16
24	37	39	38	39	40	11	12	13	15	15	17	17
25	38	40	39	40	11	12	13	14	16	16	18	18
26	39	11	40	11	12	13	14	15	17	17	19	19
27	40	12	11	12	13	14	15	16	18	18	20	20
28	11	13	12	13	14	15	16	17	19	19	21	21
29	12	14	13	14	15	16	17	18	20	20	22	22
30	13	15	14	15	16	17	18	19	21	21	23	23
31	14	16	15	16	17	18	19	20	22	22	24	24



# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Year 1771.												
Month Days	January.	February	March	April	May	June	July	August	September	October	November	December
1	25	26	25	25	27	29	29	31	33	33	35	35
2	26	27	26	26	28	30	30	32	34	34	36	36
3	27	28	27	27	29	31	31	33	35	35	37	37
4	28	29	28	28	30	32	32	34	36	36	38	38
5	29	30	29	29	31	33	33	35	37	37	39	39
6	30	31	30	30	32	34	34	36	38	38	40	40
7	31	32	31	31	33	35	35	37	39	39	41	41
8	32	33	32	32	34	36	36	38	40	40	42	42
9	33	34	33	33	35	37	37	39	41	41	43	43
10	34	35	34	34	36	38	38	40	42	42	44	44
11	35	36	35	35	37	39	39	41	43	43	45	45
12	36	37	36	36	38	40	40	42	44	44	46	46
13	37	38	37	37	39	41	41	43	45	45	47	47
14	38	39	38	38	40	42	42	44	46	46	48	48
15	39	40	39	39	41	43	43	45	47	47	49	49
16	40	41	40	40	42	44	44	46	48	48	50	50
17	41	42	41	41	43	45	45	47	49	49	51	51
18	42	43	42	42	44	46	46	48	50	50	52	52
19	43	44	43	43	45	47	47	49	51	51	53	53
20	44	45	44	44	46	48	48	50	52	52	54	54
21	45	46	45	45	47	49	49	51	53	53	55	55
22	46	47	46	46	48	50	50	52	54	54	56	56
23	47	48	47	47	49	51	51	53	55	55	57	57
24	48	49	48	48	50	52	52	54	56	56	58	58
25	49	50	49	49	51	53	53	55	57	57	59	59
26	50	51	50	50	52	54	54	56	58	58	60	60
27	51	52	51	51	53	55	55	57	59	59	61	61
28	52	53	52	52	54	56	56	58	60	60	62	62
29	53	54	53	53	55	57	57	59	61	61	63	63
30	54	55	54	54	56	58	58	60	62	62	64	64
31	55	56	55	55	57	59	59	61	63	63	65	65

Year 1772.												
Month Days	January	February	March	April	May	June	July	August	September	October	November	December
1	36	38	37	38	38	40	40	41	43	45	46	47
2	37	39	38	39	39	41	41	42	44	46	47	48
3	38	40	39	40	40	42	42	43	45	47	48	49
4	39	41	40	41	41	43	43	44	46	48	49	50
5	40	42	41	42	42	44	44	45	47	49	50	51
6	41	43	42	43	43	45	45	46	48	50	51	52
7	42	44	43	44	44	46	46	47	49	51	52	53
8	43	45	44	45	45	47	47	48	50	52	53	54
9	44	46	45	46	46	48	48	49	51	53	54	55
10	45	47	46	47	47	49	49	50	52	54	55	56
11	46	48	47	48	48	50	50	51	53	55	56	57
12	47	49	48	49	49	51	51	52	54	56	57	58
13	48	50	49	50	50	52	52	53	55	57	58	59
14	49	51	50	51	51	53	53	54	56	58	59	60
15	50	52	51	52	52	54	54	55	57	59	60	61
16	51	53	52	53	53	55	55	56	58	60	61	62
17	52	54	53	54	54	56	56	57	59	61	62	63
18	53	55	54	55	55	57	57	58	60	62	63	64
19	54	56	55	56	56	58	58	59	61	63	64	65
20	55	57	56	57	57	59	59	60	62	64	65	66
21	56	58	57	58	58	60	60	61	63	65	66	67
22	57	59	58	59	59	61	61	62	64	66	67	68
23	58	60	59	60	60	62	62	63	65	67	68	69
24	59	61	60	61	61	63	63	64	66	68	69	70
25	60	62	61	62	62	64	64	65	67	69	70	71
26	61	63	62	63	63	65	65	66	68	70	71	72
27	62	64	63	64	64	66	66	67	69	71	72	73
28	63	65	64	65	65	67	67	68	70	72	73	74
29	64	66	65	66	66	68	68	69	71	73	74	75
30	65	67	66	67	67	69	69	70	72	74	75	76
31	66	68	67	68	68	70	70	71	73	75	76	77

# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Year 1773.												
Month	January	February	March	April	May	June	July	August	September	October	November	December
Days												
1	18	20	18	19	20	21	21	23	24	25	27	27
2	19	21	19	20	21	22	22	24	25	26	28	28
3	20	22	20	21	22	23	23	25	26	27	29	29
4	21	23	21	22	23	24	24	26	27	28	30	30
5	22	24	22	23	24	25	25	27	28	29	31	31
6	23	25	23	24	25	26	26	28	29	30	32	32
7	24	26	24	25	26	27	27	29	30	31	33	33
8	25	27	25	26	27	28	28	30	31	32	34	34
9	26	28	26	27	28	29	29	31	32	33	35	35
10	27	29	27	28	29	30	30	32	33	34	36	36
11	28	30	28	29	30	31	31	33	34	35	37	37
12	29	31	29	30	31	32	32	34	35	36	38	38
13	30	32	30	31	32	33	33	35	36	37	39	39
14	31	33	31	32	33	34	34	36	37	38	40	40
15	32	34	32	33	34	35	35	37	38	39	11	11
16	33	35	33	34	35	36	36	38	39	40	12	12
17	34	36	34	35	36	37	37	39	40	11	13	13
18	35	37	35	36	37	38	38	40	11	12	14	14
19	36	38	36	37	38	39	39	11	12	13	15	15
20	37	39	37	38	39	40	40	12	13	14	16	16
21	38	40	38	39	40	11	11	13	14	15	17	17
22	39	11	39	40	11	12	12	14	15	16	18	18
23	40	12	40	11	12	13	13	15	16	17	19	19
24	11	13	11	12	13	14	14	16	17	18	20	20
25	12	14	12	13	14	15	15	17	18	19	21	21
26	13	15	13	14	15	16	16	18	19	20	22	22
27	14	16	14	15	16	17	17	19	20	21	23	23
28	15	17	15	16	17	18	18	20	21	22	24	24
29	16	18	16	17	18	19	19	21	22	23	25	25
30	17	19	17	18	19	20	20	22	23	24	26	26
31	18	20	18	19	20	21	21	23	24	25	27	27

Year 1774.												
Month	January	February	March	April	May	June	July	August	September	October	November	December
Days												
1	29	30	29	30	30	32	32	34	35	35	37	38
2	30	31	30	31	31	33	33	35	36	36	38	39
3	31	32	31	32	32	34	34	36	37	37	39	40
4	32	33	32	33	33	35	35	37	38	38	40	11
5	33	34	33	34	34	36	36	38	39	39	11	12
6	34	35	34	35	35	37	37	39	40	40	12	13
7	35	36	35	36	36	38	38	40	11	11	13	14
8	36	37	36	37	37	39	39	11	12	12	14	15
9	37	38	37	38	38	40	40	12	13	13	15	16
10	38	39	38	39	39	11	11	13	14	14	16	17
11	39	40	39	40	40	12	12	14	15	15	17	18
12	40	11	40	11	11	13	13	15	16	16	18	19
13	11	12	11	12	12	14	14	16	17	17	19	20
14	12	13	12	13	13	15	15	17	18	18	20	21
15	13	14	13	14	14	16	16	18	19	19	21	22
16	14	15	14	15	15	17	17	19	20	20	22	23
17	15	16	15	16	16	18	18	20	21	21	23	24
18	16	17	16	17	17	19	19	21	22	22	24	25
19	17	18	17	18	18	20	20	22	23	23	25	26
20	18	19	18	19	19	21	21	23	24	24	26	27
21	19	20	19	20	20	22	22	24	25	25	27	28
22	20	21	20	21	21	23	23	25	26	26	28	29
23	21	22	21	22	22	24	24	26	27	27	29	30
24	22	23	22	23	23	25	25	27	28	28	30	31
25	23	24	23	24	24	26	26	28	29	29	31	32
26	24	25	24	25	25	27	27	29	30	30	32	33
27	25	26	25	26	26	28	28	30	31	31	33	34
28	26	27	26	27	27	29	29	31	32	32	34	35
29	27	28	27	28	28	30	30	32	33	33	35	36
30	28	29	28	29	29	31	31	33	34	34	36	37
31	29	30	29	30	30	32	32	34	35	35	37	38



# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Year 1775.													Year 1776.												
Month Days													Month Days												
	January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December
1	39	11	40	11	12	13	14	15	17	17	19	19	1	20	22	21	22	23	24	25	26	28	28	30	30
2	40	12	11	12	13	14	15	16	18	18	20	20	2	21	23	22	23	24	25	26	27	29	29	31	31
3	11	13	12	13	14	15	16	17	19	19	21	21	3	22	24	23	24	25	26	27	28	30	30	32	32
4	12	14	13	14	15	16	17	18	20	20	22	22	4	23	25	24	25	26	27	28	29	31	31	33	33
5	13	15	14	15	16	17	18	19	21	21	23	23	5	24	26	25	26	27	28	29	30	32	32	34	34
6	14	16	15	16	17	18	19	20	22	22	24	24	6	25	27	26	27	28	29	30	31	33	33	35	35
7	15	17	16	17	18	19	20	21	23	23	25	25	7	26	28	27	28	29	30	31	32	34	34	36	36
8	16	18	17	18	19	20	21	22	24	24	26	26	8	27	29	28	29	30	31	32	33	35	35	37	37
9	17	19	18	19	20	21	22	23	25	25	27	27	9	28	30	29	30	31	32	33	34	36	36	38	38
10	18	20	19	20	21	22	23	24	26	26	28	28	10	29	31	30	31	32	33	34	35	37	37	39	39
11	19	21	20	21	22	23	24	25	27	27	29	29	11	30	32	31	32	33	34	35	36	38	38	40	40
12	20	22	21	22	23	24	25	26	28	28	30	30	12	31	33	32	33	34	35	36	37	39	39	11	11
13	21	23	22	23	24	25	26	27	29	29	31	31	13	32	34	33	34	35	36	37	38	40	40	12	12
14	22	24	23	24	25	26	27	28	30	30	32	32	14	33	35	34	35	36	37	38	39	11	11	13	13
15	23	25	24	25	26	27	28	29	31	31	33	33	15	34	36	35	36	37	38	39	40	12	12	14	14
16	24	26	25	26	27	28	29	30	32	32	34	34	16	35	37	36	37	38	39	40	11	13	13	15	15
17	25	27	26	27	28	29	30	31	33	33	35	35	17	36	38	37	38	39	40	11	12	14	14	16	16
18	26	28	27	28	29	30	31	32	34	34	36	36	18	37	39	38	39	40	11	12	13	15	15	17	17
19	27	29	28	29	30	31	32	33	35	35	37	37	19	38	40	39	40	11	12	13	14	16	16	18	18
20	28	30	29	30	31	32	33	34	36	36	38	38	20	39	11	40	11	12	13	14	15	17	17	19	19
21	29	31	30	31	32	33	34	35	37	37	39	39	21	40	12	11	12	13	14	15	16	18	18	20	20
22	30	32	31	32	33	34	35	36	38	38	40	40	22	11	13	12	13	14	15	16	17	19	19	21	21
23	31	33	32	33	34	35	36	37	39	39	11	11	23	12	14	13	14	15	16	17	18	20	20	22	22
24	32	34	33	34	35	36	37	38	40	40	12	12	24	13	15	14	15	16	17	18	19	21	21	23	23
25	33	35	34	35	36	37	38	39	11	11	13	13	25	14	16	15	16	17	18	19	20	22	22	24	24
26	34	36	35	36	37	38	39	40	12	12	14	14	26	15	17	16	17	18	19	20	21	23	23	25	25
27	35	37	36	37	38	39	40	11	13	13	15	15	27	16	18	17	18	19	20	21	22	24	24	26	26
28	36	38	37	38	39	40	11	12	14	14	16	16	28	17	19	18	19	20	21	22	23	25	25	27	27
29	37	38	39	40	11	12	13	15	15	17	17	17	29	18	20	19	20	21	22	23	24	26	26	28	28
30	38	39	40	11	12	13	14	16	16	18	18	18	30	19	20	21	22	23	24	25	27	27	29	29	29
31	39	40	12	14	15	17	19						31	20	21	22	23	25	26	28					

# A TABLE of Num- bers, &c.

Year 1777.												
Month Days	January.	February	March	April	May	June	July	August	September	October	November	December
1	31	33	32	33	24	35	36	37	38	39	11	11
2	32	34	33	34	35	36	37	38	40	40	12	12
3	33	35	34	35	36	37	38	39	11	11	13	13
4	34	36	35	36	37	38	39	40	12	12	14	14
5	35	37	36	37	38	39	40	11	12	13	15	15
6	36	38	37	38	39	40	11	12	14	14	16	16
7	37	39	38	39	40	11	12	13	15	15	17	17
8	38	40	39	40	11	12	13	14	16	16	18	18
9	39	11	40	11	12	13	14	15	17	17	19	19
10	40	12	11	12	13	14	15	16	18	18	20	20
11	11	13	12	13	14	15	16	17	19	19	21	21
12	12	14	13	14	15	16	17	18	20	20	22	22
13	13	15	14	15	16	17	18	19	21	21	23	23
14	14	16	15	16	17	18	19	20	22	22	24	24
15	15	17	16	17	18	19	20	21	23	23	25	25
16	16	18	17	18	19	20	21	22	24	24	26	26
17	17	19	18	19	20	21	22	23	25	25	27	27
18	18	20	19	20	21	22	23	24	26	26	28	28
19	19	21	20	21	22	23	24	25	27	27	29	29
20	20	22	21	22	23	24	25	26	28	28	30	30
21	21	23	22	23	24	25	26	27	29	29	31	31
22	22	24	23	24	25	26	27	28	30	30	32	32
23	23	25	24	25	26	27	28	29	31	31	33	33
24	24	26	25	26	27	28	29	30	32	32	34	34
25	25	27	26	27	28	29	30	31	33	33	35	35
26	26	28	27	28	29	30	31	32	34	34	36	36
27	27	29	28	29	30	31	32	33	35	35	37	37
28	28	30	29	30	31	32	33	34	36	36	38	38
29	29	31	30	31	32	33	34	35	37	37	39	39
30	30	31	32	33	34	35	36	37	38	38	40	40
31	31	32	33	34	35	36	37	38	39	39	11	11

# A TABLE answering to any of the foregoing Numbers.

Num- bers.	Times answering	
	H.	M.
11	0	48
12	1	36
13	2	24
14	3	12
15	4	00
16	4	48
17	5	36
18	6	24
19	7	12
20	8	00
21	8	48
22	9	36
23	10	24
24	11	12
25	12	00
Afternoon		
26	0	48
27	1	36
28	2	24
29	3	12
30	4	00
31	4	48
32	5	36
33	6	24
34	7	12
35	8	00
36	8	48
37	9	36
38	10	24
39	11	12
40	12	00
After Midnight		



# A TABLE of Numbers for the reader finding the Time of Highwater on any Day.

Year 1780													Year 1781.												
Months Days.													Months Days.												
	January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December
1	34	36	35	36	37	38	39	11	13	13	14	15	1	15	17	16	17	18	19	20	21	23	23	25	25
2	35	37	36	37	38	39	40	12	14	14	15	16	2	16	18	17	18	19	20	21	22	24	24	26	26
3	36	38	37	38	39	40	11	13	15	15	16	17	3	17	19	18	19	20	21	22	23	25	25	27	27
4	37	39	38	39	40	11	12	14	16	16	17	18	4	18	20	19	20	21	22	23	24	26	26	28	28
5	38	40	39	40	11	12	13	15	17	17	18	19	5	19	21	20	21	22	23	24	25	27	27	29	29
6	39	11	40	11	12	13	14	16	18	18	19	20	6	20	22	21	22	23	24	25	26	28	28	30	30
7	40	12	11	12	13	14	15	17	19	19	20	21	7	21	23	22	23	24	25	26	27	29	29	31	31
8	11	13	12	13	14	15	16	18	20	20	22	22	8	22	24	23	24	25	26	27	28	30	30	32	32
9	12	14	13	14	15	16	17	19	21	21	23	23	9	23	25	24	25	26	27	28	29	31	31	33	33
10	13	15	14	15	16	17	18	20	22	22	24	24	10	24	26	25	26	27	28	29	30	32	32	34	34
11	14	16	15	16	17	18	19	21	23	23	25	25	11	25	27	26	27	28	29	30	31	33	33	35	35
12	15	17	16	17	18	19	20	22	24	24	26	26	12	26	28	27	28	29	30	31	32	34	34	36	36
13	16	18	17	18	19	20	21	23	25	25	27	27	13	27	29	28	29	30	31	32	33	35	35	37	37
14	17	19	18	19	20	21	22	24	26	26	28	28	14	28	30	29	30	31	32	33	34	36	36	38	38
15	18	20	19	20	21	22	23	25	27	27	29	29	15	29	31	30	31	32	33	34	35	37	37	39	39
16	19	21	20	21	22	23	24	26	28	28	30	30	16	30	32	31	32	33	34	35	36	38	38	40	40
17	20	22	21	22	23	24	25	27	29	29	31	31	17	31	33	32	33	34	35	36	37	39	39	11	11
18	21	23	22	23	24	25	26	28	30	30	32	32	18	32	34	33	34	35	36	37	38	40	40	12	12
19	22	24	23	24	25	26	27	29	31	31	33	33	19	33	35	34	35	36	37	38	39	11	11	13	13
20	23	25	24	25	26	27	28	30	32	32	34	34	20	34	36	35	36	37	38	39	40	12	12	14	14
21	24	26	25	26	27	28	29	31	33	33	35	35	21	35	37	36	37	38	39	40	11	13	13	15	15
22	25	27	26	27	28	29	30	32	34	34	36	36	22	36	38	37	38	39	40	11	12	14	14	16	16
23	26	28	27	28	29	30	31	33	35	35	37	37	23	37	39	38	39	40	11	12	13	15	15	17	17
24	27	29	28	29	30	31	32	34	36	36	38	38	24	38	40	39	40	11	12	13	14	16	16	18	18
25	28	30	29	30	31	32	33	35	37	37	39	39	25	39	11	40	11	12	13	14	15	17	17	19	19
26	29	31	30	31	32	33	34	36	38	38	40	40	26	40	12	11	12	13	14	15	16	18	18	20	20
27	30	32	31	32	33	34	35	37	39	39	11	11	27	11	13	12	13	14	15	16	17	19	19	21	21
28	31	33	32	33	34	35	36	38	40	40	12	12	28	12	14	13	14	15	16	17	18	20	20	22	22
29	32	34	33	34	35	36	37	39	11	11	13	13	29	13		14	15	16	17	18	19	21	21	23	23
30	33		34	35	36	37	38	40	12	12	14	14	30	14		15	16	17	18	19	20	22	22		24
31	34	35	37			11	13						31	15				18	19	20	21				25

# A TABLE of Numbers for the reader finding the Time of High-Water on any Day.

Months Days.	Year 1782.												Months Days.	Year 1783.											
	January	February	March	April	May	June	July	August	September	October	November	December		January	February	March	April	May	June	July	August	September	October	November	December
1	26	28	27	28	29	30	31	32	34	34	36	36	1	38	39	39	40	40	11	12	14	15	16	17	18
2	27	29	28	29	30	31	32	33	35	35	37	37	2	39	40	40	11	11	12	13	15	16	17	18	19
3	28	30	29	30	31	32	33	34	36	36	38	38	3	40	11	11	12	12	13	14	16	17	18	19	20
4	29	31	30	31	32	33	34	35	37	37	39	39	4	11	12	12	13	13	14	15	17	18	19	20	21
5	30	32	31	32	33	34	35	36	38	38	40	40	5	12	13	13	14	14	15	16	18	19	20	21	22
6	31	33	32	33	34	35	36	37	39	39	11	11	6	13	14	14	15	15	16	17	19	20	21	22	23
7	32	34	33	34	35	36	37	38	40	40	12	12	7	14	15	15	16	16	17	18	20	21	22	23	24
8	33	35	34	35	36	37	38	39	11	11	13	13	8	15	16	16	17	17	18	19	21	22	23	24	25
9	34	36	35	36	37	38	39	40	12	12	14	14	9	16	17	17	18	18	19	20	22	23	24	25	26
10	35	37	36	37	38	39	40	11	13	13	15	15	10	17	18	18	19	19	20	21	23	24	25	26	27
11	36	38	37	38	39	40	11	12	14	14	16	16	11	18	19	19	20	20	21	22	24	25	26	27	28
12	37	39	38	39	40	11	12	13	15	15	17	17	12	19	20	20	21	21	22	23	25	26	27	28	29
13	38	40	39	40	11	12	13	14	16	16	18	18	13	20	21	21	22	22	23	24	26	27	28	29	30
14	39	11	40	11	12	13	14	15	17	17	19	19	14	21	22	22	23	23	24	25	27	28	29	30	31
15	40	12	11	12	13	14	15	16	18	18	20	20	15	22	23	23	24	24	25	26	28	29	30	31	32
16	11	13	12	13	14	15	16	17	19	19	21	21	16	23	24	24	25	25	26	27	29	30	31	32	33
17	12	14	13	14	15	16	17	18	20	20	22	22	17	24	25	25	26	26	27	28	30	31	32	33	34
18	13	15	14	15	16	17	18	19	21	21	23	23	18	25	26	26	27	27	28	29	31	32	33	34	35
19	14	16	15	16	17	18	19	20	22	22	24	24	19	26	27	27	28	28	29	30	32	33	34	35	36
20	15	17	16	17	18	19	20	21	23	23	25	25	20	27	28	28	29	29	30	31	33	34	35	36	37
21	16	18	17	18	19	20	21	22	24	24	26	26	21	28	29	29	30	30	31	32	34	35	36	37	38
22	17	19	18	19	20	21	22	23	25	25	27	27	22	29	30	30	31	31	32	33	35	36	37	38	39
23	18	20	19	20	21	22	23	24	26	26	28	28	23	30	31	31	32	32	33	34	36	37	38	39	40
24	19	21	20	21	22	23	24	25	27	27	29	29	24	31	32	32	33	33	34	35	37	38	39	40	11
25	20	22	21	22	23	24	25	26	28	28	30	30	25	32	33	33	34	34	35	36	38	39	40	11	12
26	21	23	22	23	24	25	26	27	29	29	31	31	26	33	34	34	35	35	36	37	39	40	11	12	13
27	22	24	23	24	25	26	27	28	30	30	32	32	27	34	35	35	36	36	37	38	40	11	12	13	14
28	23	25	24	25	26	27	28	29	31	31	33	33	28	35	36	36	37	37	38	39	11	12	13	14	15
29	24	26	25	26	27	28	29	30	32	32	34	34	29	36		37	38	38	39	40	12	13	14	15	16
30	25	26	27	28	29	30	31	33	33	35	35		30	37		38	39	39	40	11	13	14	15	16	17
31	26	27	29	31	32	34	36						31	38	39	40	12	14	16	18					



# A TABLE of Num- bers, &c.

Year 1784.

Months Days.

Months	Day																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
--------	-----	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

# A TABLE answering to any of the foregoing Numbers.

Num-  
bers.

Times answering  
H. M.

11	0	48	} After- noon.
12	1	36	
13	2	24	
14	3	12	
15	4	00	
16	4	48	
17	5	36	
18	6	24	
19	7	12	
20	8	00	
21	8	48	
22	9	36	
23	10	24	
24	11	12	
25	12	00	

26	0	48	} After Midnig.
27	1	36	
28	2	24	
29	3	12	
30	4	00	
31	4	48	
32	5	36	
33	6	24	
34	7	12	
35	8	00	
36	8	48	
37	9	36	
38	10	24	
39	11	12	
40	12	00	





## *The Use of the foregoing Tables of Numbers.*

**I**N these Tables each Page is divided into two Parts, by a black Line drawn down the Middle ; and each of the Parts are marked at the Top with the Year for which they shew the Numbers ; and under that, the Left-hand Column of each Part is marked with the Days of the Month, and the other Columns with the Months of the Year : So that if you would know the Number for any Day, suppose, for Example, on the 20th of *March*, 1774.

First, Find the given Year 1774, at the Top of the Table, and then under the given Month, which is *March*, and right against the given Day of the Month (which in this Case is 20) you will find the Number 18, which is the Number for that Day ; and if from the Number so found you subtract 10, the Remainder will be the Moon's Age for that Day.

### *The Use of the Table of the Times, answering to the foregoing Numbers.*

In this Table the Left-hand Column is marked with the given Numbers from 11 to 40, and the Figures right against any of these Numbers, give the Time answering to it in Hours and Minutes.

#### E X A M P L E I.

*I would know what Time answers to the Number 23 ?*

*Answer.* 10 Hours 24 Minutes afternoon, that is, at 24 Minutes past 10 at Night.

#### E X A M P L E II.

*What Number and Time answers to the 8th of January, 1774.*

First, By the Tables of Numbers I find the Number to be 36, and against that Number, in the Table of Times, I find 8 Hours 48 Minutes after Midnight, that is, 48 Minutes past Eight in the Morning.

## A T I D E T A B L E.

A.		H. M.			H. M.
At <i>Army</i> —————		01 03	At <i>Cork, Calis, Cape Clear,</i>		
At <i>Amsterdam</i> and <i>Armentie</i>		03 00	and in the <i>Creek</i> —————		04 30
At <i>Abarwark</i> —————		04 30	At <i>Caldy</i> and <i>Camarthen Bay</i>		05 15
At <i>Abermorick</i> and <i>Antwerp</i>		06 00	At <i>Concalo</i> —————		06 00
At <i>Aldborough</i> —————		09 45	Without the <i>Caskets</i> —————		08 15
B.			Between the <i>Caskets</i> and		
At <i>Beachy, Blacktail,</i> and be-			<i>Guernsey,</i> before <i>Cromer,</i> at		
fore the <i>Race of Blanquet</i> ———		12 00	<i>Seven Cliffs,</i> and at <i>Catness</i> —		09 00
<i>Thwart of Beachy</i> —————		12 45	At the <i>Caskets</i> and at <i>Cham-</i>		
At <i>Blackness</i> in <i>Bluet,</i> and at			<i>berness</i> —————		09 45
<i>Belle-Isle</i> —————		01 30	At <i>Cows,</i> in the <i>Foss of Caen,</i>		
Without <i>Bluet,</i> and at <i>Ber-</i>			in <i>Calice</i> and <i>Chamberness</i> Roads		10 30
<i>wick</i> —————		02 15	Before the <i>Haven of Caen,</i>		
<i>Bordeaux</i> River, the South			in the <i>Chamber,</i> between <i>Cripple</i>		
Coast of <i>Bretaigne,</i> the Coast of			<i>Sand,</i> and the <i>Croyle,</i> and at		
<i>Biscay,</i> and at <i>Bockness</i> ———		03 00	<i>Calshot</i> —————		11 15
At <i>Brest,</i> before the <i>Base,</i>			D.		
and the River of <i>Bordeaux</i>			At <i>Dover</i> Pier, and before		
within the <i>Haven</i> —————		03 45	<i>Dunkirk</i> —————		12 00
In <i>Breesound, Bloy,</i> and <i>Bal-</i>			At <i>Denbeigh</i> and at <i>Downs</i>		
<i>timore</i> —————		04 30	Road —————		02 15
Before <i>Bremen</i> and at <i>Black-</i>			At <i>Dort</i> —————		03 00
<i>ney,</i> and in the Channel before			At <i>Dungarven</i> —————		04 30
<i>Bordeaux</i> —————		06 00	At <i>Dartmouth</i> —————		06 00
At <i>Bristol</i> Key —————		06 45	At <i>Dublin</i> —————		08 15
At <i>Bridgewater</i> —————		07 30	At <i>Dunbar</i> —————		09 00
<i>Bullen</i> Deep —————		10 30	At <i>Dungeness</i> and <i>Dunnose</i>		09 45
C.			At <i>Dover, Deippe,</i> and <i>Deal</i>		10 30
In <i>Condado</i> —————		12 00	E.		
In the Chamber of <i>Rye</i> ———		00 45	At <i>Emden,</i> before the <i>Elve,</i>		
Without <i>Calis,</i> at <i>Corpus</i>			before the <i>Eyder,</i> and before		
<i>Christi</i> Point, and at <i>Camfer</i> —		01 30	<i>Enchusen</i> —————		12 00
Between <i>Calis</i> and <i>Dover,</i>			At <i>Edam</i> —————		01 30
before <i>Conquet,</i> and at the			Before the Eastern and Wes-		
<i>North Cape</i> —————		03 00	tern <i>Emes,</i> and at <i>Engomonts</i>		09 00



# A TIDE-TABLE.

81

F	H	M		H	M
On the Coast of <i>Flanders</i> —	12	00	Under <i>Holy Island</i> , & at <i>Horn</i> —	01	30
At <i>Flushing</i> —	00	45	Before <i>Hartlepoole</i> —	03	00
Before the <i>Fen</i> in the Chan-			At <i>Huntcliff-Foot</i> —	03	45
nel—	01	30	At <i>Humber</i> —	05	15
Without <i>Fountny</i> —	02	15	Before <i>Hamborough</i> , at <i>Hull</i> ,		
Without the Banks of <i>Flan-</i>			at the <i>Holmes</i> , and before <i>Hum-</i>		
<i>ders</i> —	03	00	ber's Mouth—	00	00
At <i>Flamborough</i> and <i>Brid-</i>			At <i>Haerlem</i> , <i>Havre de Grace</i> ,		
<i>lington</i> —	04	30	and <i>Home-head</i> —	09	00
At the <i>Forn</i> , in <i>Foy</i> , at <i>Fal-</i>			At <i>St. Helens</i> and <i>Harwich</i> ,		
<i>mouth</i> —	05	15	and without the Banks of <i>Har-</i>		
Between <i>Foy</i> & <i>Falmouth</i> , in			<i>wich</i> —	10	30
the Channel, and at <i>Fou'ness</i> —	06	45	At <i>Harwich</i> within—	11	15
Before the Coast of <i>Frieze-</i>					
<i>land</i> , and the <i>Fly</i> —	07	30	I		
Without the <i>Fly</i> —	08	15	At <i>Jutland Islands</i> —	12	00
At <i>Frieze</i> and <i>Fair Isle</i> —	09	00	On the W. Coast of <i>Ireland</i> —	03	00
At the <i>Fritb</i> and South			In all the Havens on the		
<i>Foreland</i> —	10	30	South Coast of <i>Ireland</i> —	05	15
In the <i>Fair Isle</i> Road, and at					
the North <i>Foreland</i> —	11	15	K		
			<i>Kentish Knock</i> —	12	00
G			At <i>Kelliers</i> —	03	00
In <i>Gibraltar</i> Road, <i>Gravel-</i>			At <i>Kingsale</i> —	04	30
<i>ling</i> , and before <i>Cherburg</i> —	12	00	At <i>Kilduyn</i> —	07	30
Before <i>Goree</i> , at <i>Guernsey</i> ,			At <i>Kildive</i> —	09	00
and at <i>Gravesend</i> —	01	30			
At <i>Groine</i> , at <i>Gascoign</i> , and			L		
the Coast of <i>Galicia</i> —	03	00	At <i>Leith</i> —	12	00
Thwart of <i>Guernsey</i> —	09	45	At <i>Lisbon</i> —	07	15
In the <i>Chamber</i> , and <i>Goree-</i>			At <i>London</i> —	03	00
<i>end</i> —	11	15	Thwart of <i>Londey</i> , and be-		
			fore <i>Lynn</i> —	05	15
H			At <i>Lynn</i> Half-tide, at <i>Lon-</i>		
Before the <i>Hewer</i> , before			<i>dey</i> —	06	00
<i>Horn</i> , and at <i>Hampton-Key</i> —	12	00	At <i>Lynn</i> —	06	45
			Z		
			At		

	H	M		O	H	M
At the <i>Lizard</i> by the Land	07	30	At <i>Orknefs</i> — — — —		03	00
At <i>Lambay</i> — — — —	08	15	At <i>Orkney</i> — — — —		09	00
At <i>Leystoft</i> and thwart off it			At <i>Orfordnefs</i> — — — —		09	45
without the Banks — — — —	09	45	At <i>Orfordnefs</i> without the			
In <i>Leystoft</i> Road, and at			Banks, and between <i>Orford</i>			
<i>Long Sand Head</i> — — — —	10	30	and <i>Orwell Waves</i> — — — —		10	30
			At <i>Orfordnefs</i> within the			
M			Sands — — — —		11	15
Within the <i>Maes</i> at <i>Mal-</i>						
<i>don</i> — — — —	00	45	P			
Before the <i>Maes</i> — — — —	0	30	At <i>Portsmouth</i> Half-Tide —		11	15
At the <i>Maes</i> , and before			At the <i>Pens</i> , <i>Portbus</i> , and			
<i>St. Matthew's</i> Point — — — —	03	45	<i>Poiſtu</i> — — — —		03	00
In <i>Mouſe-hole</i> , at <i>St. Mat-</i>			On the Coast of <i>Portugal</i> —		03	45
<i>thew's</i> , and within <i>Mount's-bay</i>	04	30	In <i>Plymouth</i> and before <i>St.</i>			
In <i>Milford</i> , at <i>Moonlefs</i> , and			<i>Paul's</i> — — — —		05	15
at <i>St. Maloes</i> — — — —	05	15	In the Haven at <i>St. Paul's</i> —		06	00
Between <i>Mouſe-hole</i> and <i>Fal-</i>			Before <i>Podeſſemeck</i> — — — —		06	45
<i>mouth</i> , and in <i>Milford-haven</i>	07	30	Thwart of <i>Plymouth</i> — — — —		07	30
In <i>St. Magnes</i> Sound, and			At the Race of <i>Portland</i> —		09	00
<i>Magnes</i> Caſtle — — — —	08	15				
At the <i>Iſle of Man</i> — — — —	09	00	Q			
Before <i>Margate</i> — — — —	11	15	At <i>Quinborough</i> — — — —		12	00
N			R			
At <i>Newport</i> Half-Tide — — — —	12	00	At <i>Rochester</i> — — — —		00	45
At the West End of the			At <i>Ramkins</i> — — — —		01	30
<i>Nore</i> — — — —	00	45	At <i>Rotterdam</i> , in <i>Robin-</i>			
Before <i>Nantz</i> River — — — —	03	00	<i>hood's Bay</i> , and from the Race			
At <i>Newcastle</i> — — — —	05	15	to the <i>Pole-Head</i> — — — —		03	00
Before <i>St. Nicholas</i> — — — —	06	45	At <i>Rouen</i> and before <i>Rochel</i>		03	45
At the <i>Needles</i> , at the <i>Iſle</i>			In <i>Ramſey</i> — — — —		05	15
of <i>Wight</i> — — — —	08	15	S			
All the Coast of <i>Normandy</i>			In the <i>Sleeve</i> , between <i>U-</i>			
and <i>Picardy</i> — — — —	10	30	<i>ſbant</i> and <i>Scilly</i> , at the <i>Shoe</i> ,			
Between the <i>Naze</i> and <i>War-</i>			at the <i>Spitts</i> , at <i>Southampton</i> ,			
<i>head</i> of <i>Lower</i> — — — —	11	15	and along the <i>Swin</i> — — — —		12	00
			Upon			



# A TIDE-TABLE.

83

	H	M		H	M
Upon the Coast of Spain, and in Shetland —————	03	00	Without Ushant —————	06	00
At Scilly, in the Sound, Scar- burgh, and at Staples —————	03	45	St. Vallery —————	10	30
At Seven Isles, without the Haven in the Broad Sound —————	04	30	W.		
At the Mouth of Severn, between Scilly and the Lizard, at the Spurn, and Stockton —————	05	15	At Winchelsea —————	00	45
Without Scilly, in the Chan- nel, and at Salcomb —————	06	00	At the Weilings, and from the West End of the Wight —————	01	30
At Sedmouth, and at the Start —————	06	45	Before the Weilings —————	02	15
Off the Start in the Channel —————	07	30	At Whitby —————	03	00
Within the Seyn, and before Shelburgh —————	09	00	In the Sea of Wales and Severn —————	04	30
At Shoreham —————	09	45	In Wales —————	05	15
At Seyn-Head —————	10	30	At Wells, at Weymouth, and at Waterford —————	06	00
T			At Weymouth Key —————	06	45
Within Tervere —————	00	45	At the Nefs, by Wiering- ben, at Winterton —————	07	30
Before Tervere, before the Thanes, and at Tinmouth —————	01	30	Thwart of the Isle of Wight in the Channel, all within the Wight, between the Wight and Beachy by the Shore —————	08	15
Before the Tees and Tinmouth before the Bay of Tinmouth —————	03	00	At the E. end of the Wight, and on Wieringben-Flats —————	09	00
At the Cliffs of the Texel —————	04	30	Y		
In Torbay, and before the Texel —————	06	00	Before Yarmouth —————	01	30
In the Road of the Texel —————	07	30	At Youghall —————	04	30
At Torgen —————	09	45	At Yarmouth —————	08	15
U			In Yarmouth Roads and Yarmouth Haven —————	10	30
Before Ureck —————	12	00	Z		
At Use —————	03	00	On the Coast of Zealand —————	01	30
Between Ushant and the Main —————	03	45	In the Zerick Sea —————	03	00
In the Vour, at the Bay, within Ushant —————	04	30			

## The Use of the TIDE-TABLE, in finding the Time of High-Water.

**I**N this Table the Names of the Places being set in alphabetical Order, they will always be found under the Letter they begin with, as for Example, *London* will be found under the Letter L, *Torbay* under T, *Scilly* under S, &c. and the Figures right against any Place shews the Time of High-Water at that Place on the Full and Change of the Moon.

Then if it be required to find the Time of High-Water at any Place upon any given Day, First, (by the Tables of Numbers and Times answering) find the Number and Time answering for that Day, (as before taught) and to that Time add the Hours and Minutes that stand in the Tide-Table against the Place you would know the Time of High-Water at, the Sum, if it doth not exceed 12 Hours, will be the Time of High-Water required; but if it should be more than 12 Hours, then subtract 12 from it, and the Remainder will be the Time of High-Water.

### E X A M P L E I.

*Suppose it was required to find the Time of High-Water at London, on the 30th of January, 1773.*

By the Table of Numbers I find the Number for the 30th of January to be 17, with which Number entering the Table of Times, I find the Time answering to be 5 H. 36 M. then looking for *London* in the Tide-Table, I find against it 3 Hours, which added to the Time before found, gives 8 H. 36 M. for the Time of High-Water at *London* on the 30th of January, 1773.

### E X A M P L E II.

*Suppose it was required to find the Time of High-Water at St. Helen's, on the 19th of August, 1774.*

Having found the Number (as before) to be 22, and the Time answering to be 9 H. 36 M. I look in the Tide-Table under the Letter H for *St. Helen's*, against which I find 10 H. 30 M. which added to the Time (as before) 9.36 gives 20.06, from which subtract 12.00, and the Remainder 8 H. 06 M. is the Time of High-Water required.



# A TABLE of the Sun's Declination for the Years 1769, 1773, 1777, and 1781.

M. Day.	Jan.	Feb.	March	April	May	June	July	Augst	Septem.	October	Novem.	Decem.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 58	16 56	07 22	04 45	15 14	22 08	23 07	17 56	08 08	03 23	14 37	21 55
2	22 53	16 39	06 59	05 08	15 32	22 16	23 02	17 41	07 46	03 46	14 56	22 04
3	22 47	16 21	06 36	05 31	15 49	22 23	22 57	17 25	07 24	04 09	15 15	22 13
4	22 41	16 02	06 13	05 54	16 07	22 30	22 52	17 09	07 02	04 33	15 34	22 21
5	22 34	15 45	05 50	06 16	16 24	22 37	22 47	16 53	06 39	04 56	15 52	22 28
6	22 26	15 26	05 27	06 39	16 41	22 43	22 41	16 37	06 17	05 19	16 10	22 35
7	22 19	15 07	05 03	07 02	16 57	22 49	22 34	16 20	05 55	05 42	16 28	22 42
8	22 11	14 48	04 40	07 24	17 14	22 54	22 27	16 03	05 32	06 05	16 45	22 48
9	22 02	14 29	04 17	07 46	17 30	22 59	22 20	15 45	05 07	06 28	17 02	22 54
10	21 53	14 10	03 53	08 08	17 45	23 04	22 13	15 28	04 46	06 51	17 19	23 00
11	21 43	13 50	03 30	08 30	18 01	23 08	22 05	15 10	04 28	07 13	17 36	23 04
12	21 34	13 30	03 06	08 52	18 16	23 12	21 56	14 52	04 01	07 36	17 52	23 09
13	21 23	13 10	02 42	09 14	18 31	23 15	21 48	14 34	03 38	07 58	18 08	23 13
14	21 13	12 50	02 19	09 36	18 45	23 18	21 39	14 15	03 14	08 21	18 24	23 16
15	21 02	12 29	01 55	09 57	18 59	23 21	21 29	13 56	02 51	08 43	18 39	23 19
16	20 50	12 08	01 31	10 18	19 13	23 23	21 19	13 37	02 28	09 05	18 54	23 22
17	20 38	11 47	01 08	10 39	19 27	23 25	21 09	13 18	02 05	09 27	19 09	23 24
18	20 26	11 26	00 44	11 00	19 46	23 26	20 59	12 59	01 42	09 49	19 23	23 26
19	20 13	11 04	00 26	11 21	19 53	23 27	20 48	12 39	01 18	10 11	19 37	23 27
20	20 00	10 43	No. 03	11 42	20 05	23 28	20 37	12 19	00 55	10 32	19 51	23 28
21	19 47	10 21	00 27	12 02	20 17	23 28	20 25	11 59	00 31	10 54	20 04	23 28
22	19 33	09 59	00 51	12 22	20 29	23 28	20 13	11 39	00 08	11 15	20 17	23 28
23	19 19	09 37	01 14	12 42	20 41	23 27	20 01	11 19	Sou. 15	11 36	20 29	23 27
24	19 04	09 15	01 38	13 02	20 52	23 26	19 48	10 58	00 39	11 57	20 41	23 26
25	18 49	08 53	02 02	13 21	21 03	23 24	19 36	10 38	01 02	12 18	20 53	23 24
26	18 34	08 30	02 25	13 41	21 13	23 22	19 22	10 17	01 26	12 39	21 03	23 22
27	18 19	08 08	02 49	14 00	21 23	23 20	19 09	09 56	01 49	12 59	21 16	23 20
28	18 03	07 55	03 12	14 19	21 33	23 17	18 55	09 34	02 11	13 19	21 26	23 16
29	17 47		03 35	14 37	21 42	23 14	18 41	09 13	02 36	13 39	21 36	23 13
30	17 30		03 59	14 56	21 51	23 10	18 26	08 51	02 59	13 59	21 46	23 09
31	17 13		04 22		22 00		18 11	08 30		14 18		23 05

# A TABLE of the Sun's Declination for the Years 1770, 1774, 1778, and 1782.

M. Day.	Jan.	Feb.	March	April	May	June	July	August	Septem.	October	Novem.	Decem.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 00	17 00	07 28	04 39	15 09	22 06	23 08	18 00	08 13	03 17	14 38	21 53
2	22 54	16 43	07 05	05 02	15 27	22 14	23 03	17 45	07 51	03 41	14 52	22 02
3	22 48	16 25	06 42	05 25	15 45	22 21	22 59	17 29	07 29	04 40	15 11	22 11
4	22 42	16 07	06 19	05 48	16 03	22 29	22 54	17 13	07 07	04 27	15 29	22 19
5	22 35	15 49	05 56	06 11	16 20	22 35	22 48	16 57	06 45	04 50	15 48	22 26
6	22 28	15 31	05 32	06 34	16 37	22 42	22 42	16 40	06 23	05 13	16 06	22 34
7	22 21	15 12	05 09	06 56	16 53	22 47	22 36	16 24	06 00	05 36	16 23	22 40
8	22 13	14 53	04 46	07 19	17 10	22 53	22 29	16 07	05 37	05 59	16 41	22 47
9	22 04	14 34	04 25	07 41	17 26	22 58	22 22	15 50	05 15	06 22	16 58	22 53
10	21 55	14 14	03 59	08 03	17 41	23 03	22 15	15 32	04 52	06 45	17 15	22 58
11	21 46	13 55	03 35	08 25	17 57	23 07	22 07	15 14	04 29	07 08	17 32	23 03
12	21 36	13 35	03 12	08 47	18 12	23 11	21 59	14 56	04 06	07 30	17 48	23 08
13	21 26	13 15	02 48	09 09	18 27	23 15	21 50	14 38	03 43	07 53	18 04	23 12
14	21 15	12 54	02 24	09 30	18 42	23 18	21 41	14 20	03 20	08 15	18 20	23 16
15	21 04	12 34	02 01	09 52	18 56	23 20	21 32	14 01	02 57	08 38	18 36	23 19
16	20 53	12 13	01 37	10 13	19 10	23 23	21 22	13 42	02 34	09 00	18 51	23 21
17	20 41	11 52	01 13	10 34	19 23	23 25	21 12	13 23	02 10	09 22	19 05	23 24
18	20 29	11 31	00 50	10 55	19 37	23 26	21 01	13 04	01 47	09 44	19 20	23 25
19	20 16	11 09	00 26	11 16	19 50	23 27	20 51	12 44	01 24	10 06	19 34	23 27
20	20 03	10 48	00 02	11 37	20 02	23 28	20 40	12 24	01 00	10 27	19 47	23 28
21	19 50	10 26	No. 21	11 57	20 15	23 28	20 08	12 04	00 37	10 49	20 01	23 28
22	19 36	10 04	00 45	12 17	20 26	23 28	20 16	11 44	00 14	11 10	20 14	23 28
23	19 22	09 42	01 09	12 37	20 38	23 27	20 04	11 24	South	11 31	20 26	23 27
24	19 08	09 20	01 32	12 57	20 49	23 26	19 52	11 03	00 33	11 52	20 39	23 26
25	18 53	08 58	01 56	13 17	20 00	23 25	19 39	10 43	00 57	12 13	20 50	23 29
26	18 38	08 36	02 19	13 36	21 11	23 23	19 26	10 22	01 20	12 34	21 02	23 23
27	18 22	08 13	02 43	13 55	21 21	23 23	19 12	10 01	01 44	12 54	21 13	23 20
28	18 07	07 50	03 06	14 14	21 31	23 18	18 58	09 40	02 07	13 14	21 24	23 17
29	17 50		03 30	14 33	21 40	23 15	18 44	09 18	02 30	13 34	21 34	23 14
30	17 34		03 53	14 52	21 49	23 11	18 30	08 57	02 54	13 54	21 44	23 11
31	17 07		04 16		21 58		18 15	08 35		14 14		23 07



# A TABLE of the Sun's Declination for the Years, 1771, 1775, 1779, and 1783.

M. Day.	Jan.	Feb.	March	April	May	June	July	August	Septem.	October	Novem.	Decem.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 01	17 04	07 33	04 34	15 05	22 04	23 08	18 03	08 19	03 12	14 28	21 51
2	22 56	16 47	07 10	04 57	15 23	22 12	23 04	17 48	07 57	03 35	14 47	22 00
3	22 50	16 30	06 47	05 20	15 41	22 20	23 00	17 32	07 35	03 58	15 06	22 09
4	22 44	16 12	06 24	05 43	15 58	22 27	22 55	17 17	07 13	04 21	15 25	22 17
5	22 37	15 54	06 01	06 05	16 16	22 34	22 49	17 01	06 50	04 45	15 43	22 25
6	22 30	15 35	05 38	06 28	16 33	22 40	22 44	16 45	06 28	05 08	16 01	22 32
7	22 23	15 17	05 15	06 51	16 49	22 46	22 37	16 28	06 05	05 31	16 19	22 39
8	22 15	14 58	04 51	07 13	17 06	22 52	22 31	16 11	05 42	05 54	16 37	22 46
9	22 06	14 39	04 28	07 36	17 22	22 57	22 24	15 54	05 20	06 17	16 54	22 51
10	21 57	14 19	04 04	07 58	17 38	23 02	22 16	15 36	04 58	06 40	17 11	22 57
11	21 48	13 59	03 41	08 20	17 53	23 06	22 09	15 19	04 35	07 02	17 28	23 02
12	21 38	13 40	03 17	08 42	18 09	23 10	22 01	15 01	04 12	07 25	17 44	23 07
13	21 28	13 20	02 54	09 04	18 23	23 14	21 52	14 43	03 49	07 48	18 00	23 11
14	21 18	12 59	02 30	09 25	18 38	23 17	21 42	14 24	03 26	08 10	18 16	23 15
15	21 07	12 39	02 06	09 47	18 52	23 20	21 34	14 06	03 02	08 32	18 32	23 18
16	20 56	12 18	01 42	10 08	19 06	23 22	21 24	13 47	02 39	08 55	18 47	23 21
17	20 44	11 57	01 19	10 29	19 20	23 24	21 14	13 28	02 16	09 17	19 08	23 23
18	20 32	11 36	00 4	10 50	19 33	23 26	21 04	13 08	01 53	09 38	19 16	23 25
19	20 19	11 15	00 32	11 11	19 47	23 27	20 55	12 49	01 29	10 00	19 30	23 26
20	20 06	10 52	00 08	11 32	19 59	23 28	20 42	12 29	01 06	10 22	19 44	23 27
21	19 53	10 32	No. 16	11 52	20 12	23 28	20 31	12 09	00 42	10 44	19 58	23 28
22	19 40	10 10	00 39	12 12	20 24	23 28	20 19	11 49	00 19	11 05	20 11	23 28
23	19 26	09 48	01 03	12 32	20 35	23 27	20 07	11 29	00 04	11 26	20 23	23 27
24	19 11	09 26	01 27	12 52	20 47	23 26	19 55	11 08	00 28	11 47	20 36	23 26
25	18 57	09 03	01 50	13 12	20 58	23 25	19 42	10 48	00 51	12 08	20 48	23 25
26	18 42	08 41	02 14	13 31	21 08	23 23	19 29	10 27	01 14	12 29	20 59	23 23
27	18 26	08 19	02 37	13 51	21 18	23 20	19 15	10 06	01 38	12 49	21 10	23 21
28	18 10	07 56	03 01	14 10	21 28	23 19	19 02	09 45	02 01	13 00	21 21	23 18
29	17 54	07 34	03 24	14 28	21 38	23 16	18 48	09 23	02 25	13 29	21 31	23 15
30	17 38	07 12	03 47	14 47	21 47	23 12	18 33	09 02	02 48	13 49	21 41	23 11
31	17 21	06 50	04 10	15 06	21 56	23 08	18 19	08 40	03 14	14 09	21 51	23 07

# A TABLE of the Sun's Declination for the Years 1772, 1776, 1780, and 1784.

M. Day.	Jan.	Feb.	March	April	May	June	July	August	Septemb.	October	Novem.	Decem.
	South	South	South	North	North	North	North	North	North	South	South	South
1	23 02	17 10	07 17	04 50	15 18	22 10	23 05	17 53	08 03	03 29	14 42	21 58
2	22 57	16 54	06 54	05 13	15 36	22 18	23 01	17 37	07 41	03 52	15 01	22 06
3	22 51	16 35	06 31	05 36	15 54	22 25	22 56	17 21	07 19	04 15	15 20	22 15
4	22 46	16 17	06 08	06 00	16 11	22 32	22 51	16 05	07 56	04 38	15 38	22 23
5	22 39	15 59	05 44	06 22	16 28	22 38	22 45	16 49	06 34	05 01	15 56	22 30
6	22 32	15 40	05 21	06 45	16 46	22 44	22 39	16 32	06 12	05 25	16 14	22 37
7	22 25	15 22	04 58	07 07	17 01	22 50	22 33	16 16	05 49	05 48	16 32	22 44
8	22 17	15 03	04 34	07 30	17 17	22 56	22 26	15 59	05 26	06 10	16 49	22 50
9	22 08	14 44	04 11	07 52	17 33	23 01	22 18	15 41	05 04	06 33	17 07	22 56
10	21 00	14 24	03 47	08 14	17 49	23 05	22 11	15 24	04 41	06 56	17 23	23 01
11	21 51	14 05	03 24	08 36	18 04	23 09	22 03	15 06	04 18	07 01	17 40	23 06
12	21 41	13 45	03 00	08 58	18 19	23 13	21 54	14 48	03 50	07 41	17 56	23 10
13	21 31	13 25	02 37	09 19	18 34	23 16	21 46	14 29	03 32	08 04	18 12	23 14
14	21 21	13 05	02 13	09 41	18 59	23 19	21 37	14 11	03 10	08 26	18 28	23 17
15	21 10	12 44	01 49	10 02	19 03	23 22	21 27	13 52	02 46	08 48	18 43	23 20
16	20 59	12 24	01 26	10 24	19 16	23 24	21 17	13 33	02 22	09 11	18 58	23 23
17	20 47	12 03	01 02	10 45	19 30	23 25	21 07	13 14	01 59	09 33	19 12	23 25
18	20 35	11 42	00 38	11 05	19 43	23 26	20 57	12 54	01 36	09 54	19 27	23 26
19	20 22	11 20	00 14	11 26	19 56	23 27	20 45	12 34	01 13	10 16	19 40	23 27
20	20 10	10 59	No. 09	11 47	20 08	23 28	20 34	12 15	00 49	10 38	19 54	23 28
21	19 57	10 37	00 33	12 07	20 20	23 28	20 22	11 54	00 26	10 59	20 07	23 28
22	19 43	10 16	00 56	12 27	20 32	23 27	20 10	11 34	00 02	11 20	20 20	23 28
23	19 29	09 54	01 20	12 47	20 43	23 26	19 58	11 14	00 21	11 41	20 32	23 27
24	19 15	09 31	01 45	13 07	20 55	23 25	19 45	10 53	00 45	12 02	20 44	23 26
25	19 01	09 05	02 07	13 26	21 05	23 24	19 32	10 32	01 08	12 23	20 56	23 24
26	18 46	08 47	02 31	13 45	21 16	23 22	19 19	10 12	01 31	12 43	21 07	23 22
27	18 30	08 25	02 54	14 04	21 26	23 19	19 05	09 50	01 55	13 04	21 18	23 19
28	18 15	08 02	03 18	14 23	21 35	23 17	18 52	09 29	02 18	13 24	21 29	23 16
29	17 59	07 39	03 41	14 42	21 44	23 13	18 33	09 08	02 42	13 41	21 39	23 12
30	17 43		04 04	15 00	21 53	23 10	18 23	08 46	03 05	14 03	21 48	23 08
31	17 26		04 27		22 02		18 08	08 24		14 23		23 00



A TABLE of the Variation of the Sun's Declination to every  
10 Degrees of Longitude.

*Degrees of Longitude from the Meridian of L O N D O N.*

Daily Vari.	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
Min.	min	min	min	min	min	min	min	min	min	min	min	min	min	min	min	min	min	min
2	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
3	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
4	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2
5	0	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	2
6	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3
7	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3
8	0	0	1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4
9	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4
10	0	1	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5
11	0	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	5
12	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6
13	0	1	1	1	2	2	2	3	3	4	4	4	5	5	5	6	6	6
14	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	7	7
15	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7	7	7
16	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8
17	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	8
18	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	9	9
19	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	9	9
20	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10
21	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	10
22	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	10	11
23	1	1	2	3	3	4	4	5	6	6	7	8	8	9	10	10	11	11
24	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12

## To find the Sun's Declination, by the foregoing T A B L E S.

**E**ACH Page of the foregoing Tables contains the Sun's Declination for the four Years that it is mark'd with at the Top, and is divided into thirteen Columns; the first of which to the Left-Hand, shews the Day of the Month, and the other Twelve the Months of the Year, so that if it be required to find the Sun's Declination for any Day, as suppose for Example, on the 21st of *August*, 1769: First I look for that Table that has 1769, at the Top of it, and then right against the 21st Day of the Month, and under *August*, I find 11 59, which shews the Sun's Declination to be 11 Degrees 59 Minutes North; according to the Title at the Top of the Column.

The Sun's Declination in these Tables being calculated for the Meridian of *London*, if you should be considerable to the Eastward, or to the Westward of *London*, it will cause some Alteration in it; to correct which, the

Table of Variation of the Sun's Declination is to be used as follows.

*First*, Look out the Declination for the given Day of the Month, and for the Day following it, and subtract the Less from the Greater, the Remainder is the daily Variation.

*Second*, Observe whether the Declination be increasing or decreasing, which you may know thus; if the Declination for the Day following the given Day be biggest, then it is increasing; but if it be least, it is decreasing.

*Third*, Look for the Daily Variation in the first Column of the Table, and see what Number stands right against it, and under the given Degrees of Longitude; which Number is to be used as follows.

If the Difference of Longitude be Easterly, and the Declination increasing, it must be subtracted from the Declination found in the Tables for the given Day; but if the Declination be decreasing, it must be added.

If the Difference of Longitude be Westerly, and the Declination increasing, it must be added; but if the Declination be decreasing, it must be subtracted; the Sum in one Case, and the Remainder in the other will be the Sun's Declination at Noon in the Longitude required.



## A TABLE of the Sun's Right Ascension.

M. Day.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Septem.	October.	November.	December.
	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M	H M
1	18 50	21 02	22 51	00 44	02 35	04 38	06 42	08 47	10 43	12 31	14 28	16 32
2	18 54	21 06	22 54	00 48	02 39	04 42	06 46	08 51	10 47	12 35	14 31	16 36
3	18 58	21 10	22 58	00 51	02 43	04 46	06 50	08 55	10 50	12 38	14 35	16 40
4	19 03	21 14	23 02	00 55	02 47	04 50	06 55	08 59	10 54	12 42	14 39	16 45
5	19 07	21 18	23 05	00 59	02 51	04 54	06 59	09 02	10 57	12 46	14 43	16 49
6	19 12	21 22	23 09	01 02	02 54	04 59	07 03	09 06	11 01	12 49	14 47	16 53
7	19 16	21 26	23 13	01 06	02 58	05 03	07 07	09 10	11 05	12 53	14 51	16 58
8	19 20	21 30	23 17	01 10	03 02	05 07	07 11	09 14	11 08	12 57	14 55	17 02
9	19 25	21 34	23 20	01 13	03 06	05 11	07 15	09 18	11 12	13 00	14 59	17 07
10	19 29	21 38	23 24	01 17	03 10	05 15	07 19	09 24	11 16	13 04	15 03	17 11
11	19 33	21 42	23 28	01 21	03 14	05 19	07 23	09 25	11 19	13 08	15 07	17 15
12	19 38	21 46	23 31	01 24	03 18	05 23	07 27	09 29	11 23	13 11	15 12	17 20
13	19 42	21 50	23 35	01 28	03 22	05 27	07 31	09 33	11 26	13 15	15 16	17 24
14	19 46	21 53	23 39	01 32	03 26	05 32	07 36	09 37	11 30	13 19	15 20	17 29
15	19 51	21 57	23 42	01 35	03 30	05 36	07 40	09 40	11 33	13 23	15 24	17 33
16	19 55	22 01	23 46	01 39	03 34	05 40	07 44	09 44	11 37	13 26	15 28	17 38
17	19 59	22 05	23 50	01 43	03 38	05 44	07 48	09 48	11 41	13 30	15 32	17 42
18	20 04	22 09	23 53	01 46	03 41	05 48	07 52	09 52	11 44	13 34	15 36	17 46
19	20 08	22 13	23 57	01 50	03 45	05 52	07 56	09 55	11 48	13 38	15 40	17 51
20	20 12	22 17	00 00	01 54	03 49	05 57	08 00	09 59	11 51	13 41	15 45	17 55
21	20 16	22 20	00 04	01 58	03 53	06 01	08 04	10 03	11 55	13 45	15 49	18 00
22	20 20	22 24	00 07	02 01	03 57	06 05	08 08	10 06	11 59	13 49	15 53	18 04
23	20 25	22 28	00 11	02 05	04 01	06 09	08 12	10 10	12 02	13 53	15 57	18 09
24	20 29	22 32	00 15	02 09	04 06	06 13	08 16	10 14	12 06	13 57	16 02	18 13
25	20 33	22 36	00 19	02 13	04 10	06 17	08 20	10 17	12 09	14 00	16 06	18 18
26	20 37	22 39	00 22	02 16	04 14	06 22	08 23	10 21	12 13	14 04	16 10	18 22
27	20 41	22 43	00 26	02 20	04 18	06 26	08 27	10 25	12 17	14 08	16 14	18 26
28	20 45	22 47	00 30	02 24	04 22	06 30	08 31	10 28	12 20	14 12	16 19	18 31
29	20 49		00 33	02 28	04 26	06 34	08 35	10 32	12 24	14 16	16 23	18 35
30	20 54		00 37	02 31	04 30	06 38	08 39	10 36	12 27	14 20	16 27	18 40
31	20 58		00 40		04 34		08 43	10 39		14 24		18 44

# A TABLE of the Right Ascension in Time, and Declination of some of the most noted fixed Stars.

The Names of the Stars.	Right Aicen.		Declina- tion	
	H.	M.	D.	M.
<i>The Bright Star of Aries</i> -----	01	54	22	22 N
<i>Medusa's Head, Algol</i> -----	02	52	39	59 N
<i>The Right side of Perseus</i> -----	03	07	48	58 N
<i>The Bull's Eye, Aldebaran</i> -----	04	22	16	09 N
<i>The Goat Star, Capella</i> -----	04	59	45	44 N
<i>The Bright-foot of Orion, Regel</i> -----	05	01	08	28 S
<i>The Northern Horn of the Bull</i> -----	05	09	28	21 N
<i>Orion's Left Shoulder</i> -----	05	10	06	04 N
<i>The Southern Horn of the Bull</i> -----	05	21	20	56 N
<i>Middle Star in Orion's Belt</i> -----	05	22	01	25 S
<i>Orion's Right Shoulder</i> -----	05	52	07	20 N
<i>Auriga's Right Shoulder</i> -----	05	44	44	54 N
<i>Bright Foot of Gemini</i> -----	06	20	16	38 N
<i>The Dog Star, Sirius</i> -----	06	34	16	23 S
<i>Castor, or the Head of the Northermost Twin</i> -----	07	20	32	24 N
<i>The little Dog Star, Procyon</i> -----	07	26	05	49 N
<i>Pollux, or the Head of the Southermost Twin</i> -----	07	28	28	34 N
<i>Hydra's Heart</i> -----	09	16	07	37 S
<i>The Lyon's Heart, Regulus</i> -----	09	53	12	56 N
<i>The Lower of the Pointers</i> -----	10	45	57	41 N
<i>The Upper of the Pointers</i> -----	10	46	63	03 N
<i>The Lyon's Tail, Deneb</i> -----	11	35	15	55 N
<i>Upper of the two last in the Square of Great Bear</i> -----	12	04	58	35 N
<i>The first in the Great Bear's Tail</i> -----	12	41	57	18 N
<i>The Virgin's Spike</i> -----	13	12	09	52 S
<i>The middle of the three in the Great Bear's Tail</i> -----	13	11	56	22 N
<i>Last but one in the Tail of Hydra</i> -----	13	50	21	43 S
<i>Last in the Great Bear's Tail</i> -----	13	36	50	31 N
<i>Arcturus</i> -----	14	03	20	26 N
<i>Bright Star in the Southern Balance</i> -----	14	35	14	53 S
<i>Foremost Guard</i> -----	15	51	75	15 N

Bright



## • A TABLE of the Fixed Stars.

The Names of the Stars.	Ascen. Right		Declina- tion	
	H.	M.	D.	M.
<i>Bright Star of the Crown</i> —————	15	22	27	33 N
<i>Bright Star in Serpent's Neck</i> —————	15	31	07	18 N
<i>The Scorpion's Heart, Antares</i> —————	16	14	25	51 S
<i>The Head of Hercules</i> —————	17	03	14	40 N
<i>In the Head of Serpentarius</i> —————	17	22	12	47 N
<i>Bright Star in the Dragon's-Head</i> —————	17	50	51	32 N
<i>Lyræ, or the Harp</i> —————	18	27	38	33 N
<i>Swan's Beak</i> —————	19	17	27	29 N
<i>Bright Star in the Eagle</i> —————	19	39	08	14 N
<i>The Swan's Tail</i> —————	20	33	44	19 N
<i>Pegasus's Mouth</i> —————	21	27	08	39 N
<i>Fomelbaut</i> —————	22	42	30	55 S
<i>Pegasus's Wing, Marchab</i> —————	22	53	13	53 N
<i>Pegasus's Leg, Scheat</i> —————	22	52	26	43 N
<i>Caphus's Knee</i> —————	23	20	76	07 N
<i>The Head of Andromeda</i> —————	23	54	27	34 N
<i>End of Pegasus's Wing, Algenib</i> —————	23	58	13	39 N
<i>Pole Star</i> —————	00	42	88	00 N
<i>Girdle of Andromeda</i> —————	00	53	34	05 N

A TABLE of the Right Ascension  
and Declination of the Crossiers.

	Right Ascen.		Declina- tion	
	H.	M.	D.	M.
<i>The Westermost of the two middle Stars</i> —————	12	03	57	28 S
<i>The Eastermost</i> —————	12	33	58	26 S
<i>The Northermost or highest Star</i> —————	12	18	55	30
<i>The Southermost or lowest</i> —————	12	12	61	48

To work an Observation, or to find the Latitude of the Place by the Tables of the Sun or Stars Declination, and their Zenith Distance, &c.

*Note,* **W**HEN you take an Observation of the Sun, by the common Sea-Quadrant, the Degrees and Minutes that your Sight-Vane stands at being added to the Degrees that your Shade or Glass-Vane stands at, will give the Zenith Distance (or Complement of the Meridian Altitude) with which and the Declination found in the Tables, you may find the Latitude as follows.

*First,* Take Notice whether the Sun or Star be to the Northward or to the Southward of you at the Time of Observation; if they are to the Northward, call your Zenith Distance North; or if they are to the Southward, call it South. Then,

*Second,* If the Zenith Distance and Declination are both North or both South, subtract the Less from the Greater, the Remainder will be the Latitude you are in, of the same Name with the Declination, if that be greater than the Zenith Distance, otherwise of a contrary Name.

*Example 1st.* Being at Sea on the 23d of *August*, 1771, I observed at Noon, and had on my Quadrant 8.34. (and the Sun to the Northward of me) what Latitude am I in?

Zenith Distance	_____	_____	_____	8. 34	North
Declination	_____	_____	_____	11. 29	North
Latitude by Observation	_____	_____	_____	2. 55	North

*Example 2d.* Being at Sea on the 23d of *December*, I took the Altitude of the Dog-Star *Syrius*, (on the Meridian to the Southward of me) 60. 00, I would know the Latitude?

*Note,* In all Cases (except where the Object is observed on the Meridian below the Pole) if the Meridian Altitude be given instead of the Zenith Distance, (as it is in this Example) then subtract it from 90. 00, and the Remainder will be the Zenith Distance.

Meridian Altitude from 90.00, leaves the Zen. Dist.	_____	_____	_____	30. 00	South
Star's Declination, (by the Table)	_____	_____	_____	16. 23	South
Latitude by Observation	_____	_____	_____	13. 37	North



## To work an Observation.

*Case the 2d.* If the Zenith Distance and Declination be one North and the other South, add them together, and their Sum will be the Latitude in, of the same Name with the Declination.

*Example 1st.* Being at Sea, on the 3d of November, 1771, I observed at Noon, and had on my Quadrant 8. 17, (and the Sun to the Northward of me) I demand the Latitude?

Zenith Distance	_____	_____	08. 17 North
Declination	_____	_____	15. 06 South
Latitude by Observation	_____	_____	23. 23 South

*Example 2d.* Being at Sea on the 21st of June, 1769, I took the Altitude of the Bright Star in the *Harp Lyræ*, (on the Meridian to the Southward of me) 51. 00. I demand the Latitude.

Complement Altitude, or Zenith Distance	_____	39. 00 South
Star's Declination	_____	38. 33 North
Latitude by Observation	_____	77. 32 North

The foregoing Rules are for observing by the Sun or Stars, when they are at their greatest Altitude, or upon the Meridian above the Pole; but as in some Parts of the Earth the Sun does not set for several Days, and some Stars never set; in that Case they may be observed upon the Meridian, twice in the 24 Hours, that is, once at their greatest Height (as before) and again, when they are the lowest, or upon the Meridian below the Pole; to work which Observation take the following Rule.

Add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude of the same Name with the Declination.

*Example,* Being at Sea, I took the Altitude of the Pole Star on the Meridian below the Pole, 46. 21 I demand the Latitude?

Meridian Altitude	_____	46. 21
Complement Declination	_____	01. 56 North
Latitude by Observation	_____	48. 17 North

The

*Remarks by the Reviser.* The Author in the above Rules and Examples, takes the Sum of the Numbers found on his Quadrant, and works with it, as if true, to find the Latitude: But the Latitude so obtained will be several Minutes from the true Latitude. For obtaining which, the Zenith Distance, as found by the Quadrant, must be first corrected, as shewn in the *Mariner's Compass Rectified*.

# The Use of the TABLES of the Sun's and Stars Right Ascension, in finding what Time any known Star will be upon the Meridian, on any given Day.

*Rule,* Look for the Right Ascension of the Sun and Star in the foregoing Tables, and subtract the Sun's Right Ascension from the Star's; but if the Sun's Right Ascension be biggest, add 24 Hours to the Star's Right Ascension, and then subtract the Sun's from it, the Remainder will be the Time of the Star's coming to the Meridian after Noon.

*Example 1st.* What Time will the *Lion's Tail Deneb*, be upon the Meridian, on the 14th of *April*? h. m.

Star's Right Ascension ————— 11. 35

Sun's Right Ascension ————— 01. 32

Time the Star will be on the Meridian ————— 10. 03 at Night

*Example 2d.* What Time will the *Bull's Eye* be on the Meridian, on the 26th of *October*?

Star's Right Ascension 4h. 22m. add 24, makes — 28. 22

Sun's Right Ascension ————— 14. 04

Time the Star will be on the Meridian ————— 14. 18 That is, *October*, 26th, at 14h. 18m. from Noon, or at 18m. past 2 in the Morning of the 27th.

To find what Star will come upon the Meridian, at any given Time.  
*Rule,* Add the Time from Noon, to the Right Ascension of the Sun, the Sum will be the Right Ascension of the Star required to be known, with which enter the Table of the Star's Right Ascension, and find what Star's Right Ascension agrees with, or comes the nearest to it, and this is the Star required.

*Example 1st.* I would know what Star would be on the Meridian, about Eight at Night, on the 7th of *April*? h. m.

Sun's Right Ascension ————— 01. 06

Time from Noon ————— 08. 00

Right Asc. of the req. Star, the nearest to which 09. 06 is *Hydra's Heart*

*Example 2d.* I would know what Star would be on the Meridian, at 2 past 2 in the Morning, on the 26th of *June* h. m.

Sun's Right Ascension ————— 06. 22

Time from Noon ————— 14. 15

Rt. Asc. of req. Star, nearest to which in the Tables 20. 37 is *Swan's Tail*



# A TABLE of the Latitudes and Longitudes of Places accounting the Longitudes from the Meridian of LONDON.

Places Names.	Latitude.		Longitude.		Places Names.	Latitude		Longitude	
The Coast of England.	D.	M.	D.	M.		D.	M.	D.	M.
<b>B</b> erwick — — —	55	48	01	45W	Aberdeen — — —	57	24 N	01	40W
Newcastle — — —	55	12	01	30W	Dundee — — —	56	28 N	02	40W
Stockton — — —	54	33	01	25W	Edinburgh — — —	55	58 N	02	59W
Spurn — — —	53	45	00	13 E	The Coast of Ireland.				
Yarmouth — — —	52	40	01	40 E	Dublin — — —	53	12	06	56
London — — —	51	32	00	00	Wexford — — —	52	13	07	27
North Foreland — — —	51	25	01	24 E	Waterford — — —	52	09	08	40
Beachy Head — — —	50	46	00	25 E	Cork — — —	51	49	09	30
Dunnofe — — —	50	38	01	23	Cape Clear — — —	51	17	11	10
Portland — — —	50	30	02	44	Limerick — — —	52	23	09	35
Start — — —	50	07	03	47	Galway — — —	53	07	09	40
Lizard — — —	49	57	05	14	Slime Head — — —	53	20	11	15
Land's-End — — —	50	06	06	00	Londonderry — — —	55	00	07	50
St. Mary Scilly — — —	49	57	06	10	Belfast — — —	54	39	06	30
Hartland Point — — —	51	06	04	35	The Coast of Holland and Flanders.				
Lundy Isle — — —	51	20	04	40	Scaw — — —	57	30	10	20
Bristol — — —	51	33	04	35	Helighland — — —	54	24	08	35
St. David's Head — — —	51	00	05	22	Hambrough — — —	53	41	10	35
Barfey Isle — — —	52	44	05	00	Embden — — —	53	05	07	35
Holyhead — — —	53	23	04	50	The Fly — — —	53	15	05	30
Liverpool — — —	53	20	03	00	The Texel — — —	53	15	05	10
Whitehaven — — —	54	25	03	30	Amsterdam — — —	52	23	05	04
Carlisle — — —	54	47	03	05	Rotterdam — — —	51	55	04	30
The Coast of Scotland.					The Brill — — —	52	00	04	00
Glasgow — — —	55	52	04	05	Sluice — — —	51	14	03	43
N. Part of Sky Isle — — —	57	45	05	45	Calais — — —	50	58	01	54
N. Part of Lewis Isle — — —	58	20	07	20	The Coast of France and Portugal.				
St. Kilday — — —	57	52	09	45	Diep — — —	49	56 N	01	09 E
Farra Head — — —	58	34	05	10	Cape de Hague — — —	49	47 N	02	00 W
Isles of Orkney — — —	59	10	03	22	Gaskets — — —	49	50 N	02	20 W
Shetland S. Point. — — —	60	04	02	00	Guernfey — — —	49	33 N	02	20 W
Buchanefs — — —	57	45	01	18					

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
	D.	M.	D.	M.		D.	M.	D.	M.
The Coast of France and Portugal.									
Morlaix — — —	48	33	03	49	Ancona — — —	43	40	14	26
Ushant — — —	48	30	05	02	Venice — — —	45	25	12	10
Brest — — —	48	23	04	25	Lepanto — — —	38	10	22	52
Penmark — — —	47	48	04	24	Cape Matapan — —	36	33	22	41
Belleisle — — —	47	20	03	16	Cape St. Angelo —	36	32	23	56
Nantz — — —	47	14	01	39	Athens — — —	37	58	24	05
Island Dieu — —	46	34	02	13	Cape Martelo, S. }	38	07	25	03
Isle of Ree — —	46	10	01	30	part of Negropont }				
Rochel — — —	46	10	01	11	Cape Monte Sancto	40	26	25	02
Bordeaux — — —	44	50	00	38	Gallipoly — — —	40	33	27	20
Bilboa — — —	43	29	02	58	Constantinople —	40	59	28	56
Cape Ortegal — —	44	04	07	48	Smyrna — — —	38	28	27	25
Cape Finister — —	43	12	09	40	Ephesus — — —	38	01	27	53
Oporto — — —	41	10	09	25	Antiocheta — — —	36	30	32	46
Burlings — — —	39	35	09	24	Scanderoon — — —	36	34	36	30
Rock of Lisbon —	38	54	09	50	Tripoli — — —	34	38	36	15
Cape St. Vincent —	36	53	09	06	Alexandria — — —	31	10	30	19
Cadiz — — —	36	33	06	01	Cape Rosato — — —	32	48	21	25
Cape Trefalgar —	36	10	06	01	Cape Miserato — —	32	21	16	17
On the main Continent within the Straits.					Tripoly — — —	32	54	13	10
Gibraltar — — —	36	12	04	53 W	Cape Bona — — —	37	03	11	04
Cape de Gat — — —	36	40	01	40 W	Bona — — —	37	02	08	19
Cape Paul — — —	38	15	00	05	Algier — — —	37	05	03	16
Cape Martin — — —	38	46	00	40	Cape de Tres Forcas	35	30	02	04 W
Barcelona — — —	41	26	02	18	Tetuan — — —	35	27	05	06 W
Marfeilles — — —	43	18	05	27	Ceuta — — —	35	54	04	45 W
Toulon — — —	43	07	06	02	Tangier — — —	35	42	05	22 W
Genoa — — —	44	25	08	43	Islands within the Straits.				
Leghorn — — —	43	28	10	35	Alboran — — —	35	54	02	29 W
Rome — — —	41	54	12	45	Formentaria — —	38	33	01	55
Naples — — —	40	51	14	46	Yvica — — —	38	50	01	40
Cape Sparteventuro	37	55	16	55	Majorca City — —	39	30	03	03
Cape Collone — —	38	56	18	05	Port Mahon — — —	39	42	04	12
Gallipoli — — —	39	56	18	43	Gallita — — —	37	41	08	44
Cape St. Mary — —	39	45	19	00	S. end of Sardinia	38	46	09	12
					N. end of Corfica	42	56	09	50



## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
Islands within the Straits.	D.	M.	D.	M.		D.	M.	D.	M.
Gorgona —————	43	34	09	38	Affineé —————	04	15	02	17W
Capria —————	43	03	14	54	Cape three Points —	04	28	01	50W
Lilboa —————	42	45	11	00	River Volta —————	05	55	03	25
Messina —————	38	07	16	20	River Formosa —————	07	00	07	20
Maritimo —————	38	12	17	09	Cape Formosa —————	04	15	06	40
Cape Passaro —————	36	38	15	40	New Callabar —————	04	42	08	33
Malta —————	35	53	14	32	Old Callabar —————	04	10	09	45
Corfu —————	39	42	20	06	River Camaroons —	03	25	10	10
Zephalonia —————	38	15	21	00	River Angra —————	00	50	10	01
Zant —————	37	46	21	14	Cape Lopez —————	00	55	09	55
Morea —————	36	52	21	32	River Congou —————	05	40	15	25
Lemnos —————	39	59	25	37	Angola —————	08	57	15	56
Scio —————	38	22	26	12	Cape Negro —————	16	08	12	31
C. St. John West } end of Candia }	35	15	24	00	Cape St. Thomas —	24	10	14	43
Cape Solomon East } end of Candia }	35	00	27	08	Cape Bona Esperance	34	07	19	35
City of Rhodes —————	36	42	28	05	The Western Islands.				
West end of Cyprus	34	57	32	23	Corvo —————	39	54	30	55
East end of Cyprus	35	31	35	00	Flores —————	39	32	30	54
The Coast of Barbary and Guiney.					Fial —————	38	53	28	15
Cape Spartel —————	35	50	05	49	Pico —————	38	40	27	20
Sallee —————	33	51	06	25	St. George —————	38	52	26	03
Cape Cantin —————	32	36	09	10	Tercera —————	38	57	25	34
Cape de Geer —————	30	27	10	06	St. Michael —————	38	06	23	36
Cape Bajadore —————	26	04	15	35	St. Maries —————	36	59	23	38
Cape Olerado —————	23	41	15	50	The Canary Islands.				
Cape Blanco —————	20	32	17	35	Ferro —————	27	54	17	45
Senegal —————	15	28	16	25	Palma —————	28	40	17	36
Cape de Verde —————	14	43	17	20	Gomera —————	28	06	17	05
River Gambia —————	13	08	15	31	Tenariff —————	28	23	16	28
Sierralion —————	08	36	12	57	Madeira West end —	32	44	17	26
Cape Monserado —————	06	05	10	02	Porto Sancto —————	33	12	15	54
Cape Pulmas —————	04	13	06	45	Canaria —————	27	52	15	10
Jaque Jaque —————	04	16	02	57	Forteventura —————	28	05	13	36
					Lancerota —————	29	02	12	45

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
Cape de Verde Islands.	D.	M.	D.	M.		D.	M.	D.	M.
St. Vincent ———	17	04	24	39	Vifegapatam ———	17	43	83	57
St. Lucia ———	17	00	24	30	Cape Palmiras ———	20	42	87	52
St. Nicholas ———	16	50	23	48	Bengal ———	22	17	92	21
Braya ———	14	28	24	02	Cape Negrais ———	16	23	93	00
Fuego ———	14	50	23	41	Malacca ———	02	12	102	10
St. Jago ———	15	08	22	56	Siam Entrance ———	14	18	100	55
Isle of May ———	15	14	22	02	Cambodia Entrance	10	28	105	00
Isle Sal ———	16	50	22	08	Cochin ———	14	05	107	56
Bonavista ———	16	05	22	07	Canton ———	23	14	113	06
The Southern Islands.					Amoy or Quemoy ———	24	35	116	50
St. Matthews ———	01	30 S	06	01 W	Lampo ———	29	59	120	35
Ascension ———	07	40 S	14	25 W	Nanquin ———	32	55	120	01
St. Hellena ———	16	00 S	06	14 W	Islands in the East-Indies.				
Fernandepo ———	02	40 N	10	30 E	Madagascar } S. end	25	47	46	10
Princes ———	01	40 N	09	15 E	or St. Lau. } N. end	12	10	51	05
St. Thomas ———	00	00	08	20 E	rence ———	13	10	45	38
Annabona ———	02	10 S	07	27 E	Mayetta ———	12	05	44	23
The Coast on the Main Continent in the East-Indies.					Mohilla ———	11	40	43	50
Cape Lagulias ———	34	54 S	21	20	Comero ———	16	30	42	40
Cape Corientes ———	23	40 S	36	17	St. Juan de Nova ———	20	10	52	55
Mofambique ———	15	04 S	41	10	Mauritius ———	19	50	61	30
River de Fugos ———	00	14 S	41	15	Diego Roys ———	28	45	67	17
Cape Bassos ———	04	06	47	38	Romiras de } ———	38	40	72	45
Cape Guardafoy ———	11	44	51	20	Castelmas-- }	16	38	64	30
Cape Rosulgat ———	22	41	59	45	Amsterdam ———	08	40	68	25
Cape Muca ———	23	32	59	45	St. Brandon ———	03	53	52	36
Buffera ———	29	45	49	20	Diego Gratiofa ———	06	55	68	45
Surrat ———	21	10	72	25	Quebella ———	00	20	72	00
Goa ———	15	31	73	50	Bassos de Chagos ———	07	14	73	04
Callicot ———	11	16	75	30	Yas de Diego Rays	00	25	76	22
Cochin ———	09	54	75	55	Maldivia { N. end	09	00	72	58
Cape Camarine ———	07	50	77	25	Malique ———	12	21	54	05
Fort St. George ———	13	11	80	32	Sacatra ———	12	04	55	04
Dew Point ———	16	08	81	32	Abdeleur ———				



## A TABLE of the Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
Islands in the East Indies.	D.	M.	D.	M.	The Coast of America, in the South-Sea.	D.	M.	D.	M.
C. Gallo, in Zeloan-	06	07	81	15	Cape St. Sebastians--	42	45	127	55
Yas de Amber—	00	00	52	30	Cape St. Lucia —	23	20	111	46
Andaman —	12	10	93	32	Cape Corientes—	19	40	109	30
Nichobar —	07	11	93	40	Aquapulco—	17	05	104	18
Sumatra NW end—	05	22	94	50	Aquatulco—	15	27	102	03
Verkins Island —	02	22	64	07	Guatemala—	14	25	101	00
Nassau Island—	02	54	99	32	Panama—	08	50	81	52
Bencola —	03	55	104	08	Bay Bonaventura —	03	24	78	06
Sumatra SE end —	05	22	105	10	Isle Gallopega—	00	00	90	10
Engano—	05	50	101	43	Cape del Ajugo—	06	30	84	50
Selam —	08	20	102	13	Lima—	12	15	77	30
Princes Island—	06	30	104	02	Arica—	18	29	73	10
Bantam in Java—	06	11	105	55	La Sereua—	29	00	76	22
Batavia —	06	16	106	46	I. Juan Fernando —	33	15	83	18
Java E. end —	08	32	113	30	Baldivia—	39	35	81	10
Straits of Sundy —	06	02	105	46	Port Steven—	46	50	82	36
Banca S. end —	03	20	106	45	Cape Victory—	52	00	83	10
Borneo St point—	03	54	113	37	Cape Horn—	57	58	79	55
Bandy Isles—	04	55	127	17	The Coast of Brazil from Cape Horn to Cape Roque.				
Celebes { S. end	05	10	119	07					
{ N. end	01	40	121	20	Magellan E. entr.—	52	00	75	05
Mindano W. point	06	40	119	15	River Julian—	48	40	74	34
Borneo N. point —	07	10	113	05	Cape Blanco near	46	50	72	07
Luconia { SW. point	12	30	120	10	River Camaroons }				
{ NE. point	18	35	120	05	Buenos Ayres, or	36	10	57	54
Anian { W. point	19	30	107	00	River Plate—				
{ E. point	19	55	109	55	River Grand—	31	55	52	00
Formosa { S. point	22	00	119	56	St. Katherine's—	27	50	49	00
{ N. point	25	30	120	45	Cape Frio—	23	00	42	20
Piscadore Isles—	23	30	118	35	Spirito Santo—	19	59	42	10
Island Chufan—	30	38	120	35	P. Segura—	16	34	40	35
Japan { SE. point	35	30	140	30	Bay Todos Santos	12	46	41	00
{ SW. point	35	00	128	30	River St. Francisco	10	50	37	50

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
The Coast of Brazil, &c.	D.	M.	D.	M.		D.	M.	D.	M.
Cape Sr. Augustine	08	35 S	35	20 W	St. Bartholomew	17	52	62	06
Cape Roque —	05	00 S	35	47 W	St. Martins —	18	06	62	10
Tristian de Cunha	37	05 S	13	24 W	Anguilla —	18	17	62	13
Trinidad —	20	30 S	30	00 W	Virgins —	18	30	63	25
Main Continent in the West-Indies.					St. Cruz —	17	52	63	30
					Bieque —	18	00	63	15
R. Amazons Entr.	00	00	49	56	Porto Rico St. Johns	18	30	65	37
North Cape —	02	05	49	56	St. Domingo Hstp.	18	25	69	30
Surinam —	06	25	56	50	Port Royal Jamaica	17	40	76	32
Oronoque —	08	15	59	25	East end of Cuba	20	15	73	55
Cape Conquibaca	12	40	70	42	Havannah —	22	40	82	55
Carthagen —	10	28	75	21	Bay of Hondy —	22	45	83	40
Scots Settlement	08	30	78	45	Cape St. Anthony	21	45	85	32
Nicaragua Entrance	11	25	84	15	Bahama Islands.				
Cape Catoche —	21	10	86	10					
Campeachy —	19	30	92	10	Bermudas —	32	25	63	40
La Vera Cruz —	19	12	97	48	N. point of Baha-	28	00	78	35
Escondido —	30	20	89	30	ma Bank —				
Cape Florida —	24	57	80	30	Bahama Island —	26	50	79	36
The Caribbee Islands.					Abacco S. point	26	00	73	46
					Harbour Island —	25	37	76	47
Trinidad —	10	15	60	17	Andros N. point	25	10	78	50
Tobago W. end	11	10	59	10	Providence S. point	25	00	77	20
Granado —	11	57	60	20	Illathera S. point	24	40	75	56
Barbadoes —	12	58	58	50	Cat Island —	24	25	75	09
St. Vincent —	13	12	60	12	Watling Island —	24	03	74	35
St. Lucia —	13	55	60	04	Rum Key —	23	45	74	50
Martinico —	14	43	60	54	Exuma —	23	22	75	55
Dominico —	15	23	60	30	Crooked Island	22	56	74	12
Marigallante —	15	58	60	20	N. point —				
Guardalupe —	16	10	61	15	Atkins Key —	22	17	74	05
Monserat —	16	45	62	15	Meraparovouz —	21	58	74	45
Antigua —	17	05	61	45	Atwood's Key —	23	10	73	35
Nevis —	17	05	62	32	French Keys —	22	40	73	40
St. Christophers	17	17	62	40	Mayeguana —	22	35	72	46
Barbuda —	17	50	60	40	Hogsties —	21	17	73	55



## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
Bahama Islands.	D.	M.	D.	M.	The Coast of Hud- son's Bay & Straits.	D.	M.	D.	M.
Heneago —————	20	52 N	73	46 W	Suttons Isle —————	60	25	66	27
Caicos Bank N. } point —————	21	50 N	71	15 W	Cape Charles —————	62	10	75	35
Turks Island —————	21	35 N	70	08 W	Cape Walsingham —————	62	35	77	55
Abrolho N. point —————	21	35 N	69	06 W	Mansfield Isle —————	61	42	80	30
Plate Wreck —————	20	10 N	68	15 W	Cape Jones —————	54	55	78	58
The Coast of Carolina, Virginia, Mary- land, Pensilvania, New England, and Newfoundland.					Rupert's River —————	51	30	79	26
					Albany River —————	52	26	84	50
					The Cubbs —————	54	10	82	40
					C. Henrietta Maria —————	55	07	84	30
					Port Nelson —————	57	10	93	58
					Cape Churchill —————	59	00	95	20
					Cape Southampton —————	61	55	86	48
					Shark Point —————	64	30	82	55
					Nottingham Isle —————	63	30	79	53
					Q. Ann's Foreland —————	63	48	74	45
Charles Town up- } on Ashley River —————	32	45	78	46	Resolution Isle —————	61	50	65	04
Cape Hatteras —————	35	15	74	20	Cape Farewell —————	59	45	46	45
Cape Henry —————	37	00	75	24	The Coast of Iceland, Greenland, Nova Zembla, and Northern Isles.				
Cape Charles —————	37	16	74	16					
Cape Hinlopen —————	38	50	74	56					
Long Island —————	40	50	72	45					
New York —————	40	58	73	53					
Cape Cod —————	42	12	68	55					
Boston —————	42	30	69	23					
Cape Sable —————	43	50	64	58					
Isle Sable —————	44	20	59	01					
Cape Britain —————	46	00	58	30					
Quebec —————	46	55	69	48	Sound Royal —————	66	22	14	33
Bay of Brest —————	52	10	56	57	Bargazar Point —————	66	20	16	35
Bell Island —————	52	07	55	35	Whales Back —————	65	27	20	33
Cape St. John —————	50	15	52	48	Merchants Foreland —————	63	25	17	05
Cape Bonavista —————	49	15	52	12	Halliford —————	64	30	34	43
Trinity Bay Ent. —————	48	42	52	20	Fair Foreland —————	66	20	26	27
Conception Bay —————	48	20	52	08	Grims Island —————	67	15	22	34
St. John's Harbour —————	48	00	51	39	Westmania Isles —————	63	30	22	24
Bay of Bulls —————	47	50	51	29	Isles of Fero —————	62	06	05	00
Cape Race —————	46	40	51	52	Beerenberg, or } John Main's Isle }	71	45	04	30 E
Cape St. Mary —————	47	10	53	23	Point Look-out —————	76	25	15	36 E
Placentia —————	47	45	53	58	Horn Sound —————	76	45	13	36 E
Cape Roy —————	48	00	57	40	Fair Foreland —————	79	20	10	52 E
					Hacluit's Foreland —————	79	55	11	00 E
					Helie's Sound —————	78	55	21	50 E

## A TABLE of Latitudes and Longitudes.

Places Names.	Latitude		Longitude		Places Names.	Latitude		Longitude	
	D.	M.	D.	M.		D.	M.	D.	M.
The Coast of Iceland Greenland, Nova Zembla, and Nor- thern Isles.									
Lee's Foreland—	78	05	23	25	Gottenburgh—	57	50	12	15
Whales Head—	77	18	21	30	Elfinore—	56	22	12	42
Hope Island—	76	18	23	45	Copenhagen—	55	41	12	50
Cherry or Bear Isle—	74	30	18	08	Valsterborn—	55	28	13	00
Admiralty Isle—	75	05	54	50	Kalmer—	56	40	16	35
Fretum Borrough—	70	00	61	20	Stockholm—	59	20	19	30
Cape Candinose—	69	05	42	35	Wybourg—	60	52	29	16
Catnose—	65	43	35	14	Petersburgh—	60	00	30	25
Archangle Bar—	64	30	40	30	Narva—	59	17	28	25
Crofs Island—	66	31	36	33	Revel—	59	25	24	51
Sweetnose—	68	10	34	45	Riga—	57	04	25	15
Kilduyn—	69	30	31	20	Derwinda—	57	15	22	06
North Cape—	71	23	23	02	Koningsberg—	54	43	21	35
Surroy—	71	05	16	40	Dantzick—	54	22	18	36
Tromsund—	70	25	15	30	Wisby in Gotland—	57	30	18	30
Læfort SW. point—	68	15	09	30	Bornholm—	55	15	14	45
Dronon—	63	50	10	15	Straelsound—	54	25	13	16
Stadland—	62	10	04	38	Lubeck—	54	06	09	55
North Bergen—	60	10	05	40	Anout—	56	50	11	06
Naze of Norway—	57	45	07	24	Lefou—	57	05	10	30
					Scaw—	57	30	10	20
The Coast in the Sound and Baltick									
Mardon—	58	19	08	57					
Larwick—	58	54	09	20					
Christiana—	59	20	10	00					
Mæsterland—	57	53	11	45					

The Latitudes of any two Places being given, to find the Difference of Latitude between them.

Rule, If the Latitudes are both North, or both South, subtract the Less from the Greater, the Remainder will be the Difference of Latitude.

But



## Rules for Latitude.

105

But if one Latitude be North, and the other South, then add them together, and their Sum will be the Difference of Latitude.

*Example 1st.* What is the Difference of Latitude between the *Lizard* and *Barbadoes*?

	d.	m.	
<i>Lizard</i> , in Latitude	—	—	49 57 N.
<i>Barbadoes</i> , in Latitude	—	—	12 58 N.
The Difference of Latitude	—	—	36 59

*Example 2d.* What is the Difference of Latitude between *Jamaica* and *Cape Bona Esperance*?

	—	—	17 40 N.
<i>Jamaica</i> , in Latitude	—	—	34 07 S.
<i>Cape Bona Esperance</i> , in Latitude	—	—	51 47 which De-
The Difference of Latitude	—	—	51 47 which De-

grees being multiplied by 60, and the odd 47 Min. - 60  
taken in, will give the Difference of Latitude in 3107 Miles.

## Rules for Latitude.

The Latitude sail'd from, and the Difference of Latitude being given, to find what Latitude the Ship is come into.

*Case the 1st.* When you sail from North Latitude to the Northward, or from South Latitude to the Southward, add the Difference of Latitude (it being first brought into Degrees, if need be, by dividing it by 60) to the Latitude sail'd from, the Sum will be the Latitude you are come into, of the same Name with the Latitude sail'd from.

*Example 1st.* A Ship from a Place in the Latitude 14 10 N. sails to the Northward till she makes her Difference of Latitude 04 21. What Latitude is she come into?

Latitude sail'd from	—	—	14 10 N.
Difference of Latitude	—	—	04 21
Latitude come into	—	—	18 31 N.

*Example 2d.* A Ship from Latitude 29 17 S. sails to the Southward till she makes her Difference of Latitude 374 Miles: What Latitude is she come into?

Latitude sail'd from	—	—	29 17 S.
Difference of Lat. 374 Miles, divided by 60 makes	—	—	06 14
Latitude come into	—	—	35 31

F f

Case





# Rules for Longitude.

107

Cape *Finisterre*, in Longitude ——— 09 40 W.  
*Antigua*, in Longitude ——— 61 45 W.

The Difference of Longitude ——— 52 05

*Example 2d.* What is the Difference of Longitude between *Barcelona* and the Rock of *Lisbon* ?

*Barcelona*, in Longitude ——— 02 18 E.  
 Rock of *Lisbon*, in Longitude ——— 09 50 W.

The Difference of Longitude ——— 12 08

*Example 3d.* What is the Difference of Longitude between the S. E. Point of *Japan*, and the Island of *St. Christopher* ?

S. E. Point of *Japan*, in Longitude ——— 140 30 E.  
*St. Christopher's*, in Longitude ——— 62 40 W.

Exceeds 180.00—203 10  
 Subtract it from—360 20

Remains the Difference of Longitude—156 50

The Longitude sail'd from, and the Difference of Longitude being given, to find what Longitude the Ship is come into.

*Case 1st.* When you sail from East Longitude to the Eastward, or from West Longitude to the Westward, add the Difference of Longitude to the Longitude sail'd from, the Sum (if less than 180 Degrees) is the Longitude come into, of the same Name with the Longitude you sail'd from.

But if the Sum should be more than 180 Degrees, then subtract it from 360.00. and the Remainder will be the Longitude you are come into, of a contrary Name to the Longitude you sail'd from.

*Example 1st.* A Ship from Longitude of 48 21 East, sails to the Eastward, till she makes her Difference of Longitude 287 Miles. What Longitude is she come into ?

Longitude sail'd from ——— 48 21 E.  
 Difference of Longitude 287 Miles, or 04 47

Longitude come into ——— 53 08 E.

*Example 2d.* A Ship from the Longitude of 178 47 W. fails to the Westward till her Difference of Longitude be 12 17 : What Longitude is she come into ?

Lon-

## Rules for Longitude.

Longitude fail'd from	—	—	—	—	178 47 W.
Difference of Longitude	—	—	—	—	12 17
					191 04
Exceeds	180.00	—			360 00
Subtract it from	—	—	—	—	168 56 E.

*Case the 2d.* When you fail from East Longitude to the Westward, or from West Longitude to the Eastward, subtract the Difference of Longitude (if it be least) from the Longitude you fail'd from, and the Remainder will be the Longitude come into, of the same Name with the Longitude fail'd from.

But if the Difference of Longitude be the biggest, then subtract the Longitude from the Difference of Longitude, and the Remainder will be the Longitude come into, of a contrary Name to the Longitude fail'd from.

*Example 1st.* A Ship from Longitude 98 17 E. fails to the Westward till she makes her Difference of Longitude 14 21 : What Longitude is she come into ?

Longitude fail'd from	—	—	—	—	98 17 E.
Difference of Longitude	—	—	—	—	14 21
					83 56 E.

*Example 2d.* A Ship from Longitude 44 21 West fails to the Eastward till her Difference of Longitude be 81 42 : What Longitude is she come into ?

Longitude fail'd from	—	—	—	—	44 21 W.
Difference of Longitude	—	—	—	—	81 42
					37 21 E.

Here follows a Table of Meridional Parts, to every Degree and Minute of Latitude.



M	0 d	1 d	2 d	3 d	4 d	5 d	6 d	7 d	8 d	9 d	10 d	11 d	12 d	13 d	M
0	0	60	120	180	240	300	361	421	482	542	603	664	725	787	0
1	1	61	121	181	241	301	362	422	483	543	604	665	726	788	1
2	2	62	122	182	242	302	363	423	484	544	605	666	727	789	2
3	3	63	123	183	243	303	364	424	485	545	606	667	728	790	3
4	4	64	124	184	244	304	365	425	486	546	607	668	729	791	4
5	5	65	125	185	245	305	366	426	487	547	608	669	730	792	5
6	6	66	126	186	246	306	367	427	488	548	609	670	731	793	6
7	7	67	127	187	247	307	368	428	489	549	610	671	732	794	7
8	8	68	128	188	248	308	369	429	490	550	611	672	733	795	8
9	9	69	129	189	249	309	370	430	491	551	612	673	735	796	9
10	10	70	130	190	250	310	371	431	492	552	613	674	736	797	10
11	11	71	131	191	251	311	372	432	493	553	614	675	737	798	11
12	12	72	132	192	252	312	373	433	494	554	615	676	738	799	12
13	13	73	133	193	253	313	374	434	495	555	616	677	739	800	13
14	14	74	134	194	254	314	375	435	496	556	617	678	740	801	14
15	15	75	135	195	255	315	376	436	497	557	618	679	741	802	15
16	16	76	136	196	256	316	377	437	498	558	619	680	742	803	16
17	17	77	137	197	257	317	378	438	499	559	620	681	743	804	17
18	18	78	138	198	258	318	379	439	500	560	621	682	744	805	18
19	19	79	139	199	259	319	380	440	501	561	622	683	745	806	19
20	20	80	140	200	260	320	381	441	502	562	623	684	746	807	20
21	21	81	141	201	261	321	382	442	503	563	624	685	747	808	21
22	22	82	142	202	262	322	383	443	504	564	625	686	748	809	22
23	23	83	143	203	263	323	384	444	505	565	626	687	749	810	23
24	24	84	144	204	264	324	385	445	506	566	627	688	750	811	24
25	25	85	145	205	265	325	386	446	507	567	628	689	751	812	25
26	26	86	146	206	266	326	387	447	508	568	629	690	752	813	26
27	27	87	147	207	267	327	388	448	509	569	630	691	753	814	27
28	28	88	148	208	268	328	389	449	510	570	631	692	754	815	28
29	29	89	149	209	269	329	390	450	511	571	632	693	755	816	29
30	30	90	150	210	270	330	391	451	512	572	633	694	756	817	30
31	31	91	151	211	271	331	392	452	513	573	634	695	757	818	31
32	32	92	152	212	272	332	393	453	514	574	635	696	758	819	32
33	33	93	153	213	273	333	394	454	515	575	636	697	759	820	33
34	34	94	154	214	274	334	395	455	516	576	637	698	760	821	34
35	35	95	155	215	275	335	396	456	517	577	638	699	761	822	35
36	36	96	156	216	276	336	397	457	518	578	639	700	762	823	36
37	37	97	157	217	277	337	398	458	519	579	640	701	763	824	37
38	38	98	158	218	278	338	399	459	520	580	641	702	764	825	38
39	39	99	159	219	279	340	400	460	521	581	642	703	765	826	39
40	40	100	160	220	280	341	401	461	522	582	643	704	766	827	40
41	41	101	161	221	281	342	402	462	523	583	644	705	767	828	41
42	42	102	162	222	282	343	403	463	524	584	645	706	768	829	42
43	43	103	163	223	283	344	404	464	525	585	646	707	769	830	43
44	44	104	164	224	284	345	405	465	526	586	647	708	770	831	44
45	45	105	165	225	285	346	406	466	527	587	648	709	771	832	45
46	46	106	166	226	286	347	407	467	528	588	649	710	772	833	46
47	47	107	167	227	287	348	408	468	529	589	650	711	773	834	47
48	48	108	168	228	288	349	409	469	530	590	651	712	774	835	48
49	49	109	169	229	289	350	410	470	531	591	652	713	775	836	49
50	50	110	170	230	290	351	411	471	532	592	653	714	776	837	50
51	51	111	171	231	291	352	412	472	533	593	654	715	777	838	51
52	52	112	172	232	292	353	413	473	534	594	655	716	778	839	52
53	53	113	173	233	293	354	414	474	535	595	656	717	779	840	53
54	54	114	174	234	294	355	415	475	536	596	657	718	780	841	54
55	55	115	175	235	295	356	416	476	537	597	658	719	781	842	55
56	56	116	176	236	296	357	417	477	538	598	659	720	782	843	56
57	57	117	177	237	297	358	418	478	539	599	660	721	783	844	57
58	58	118	178	238	298	359	419	479	540	600	661	722	784	845	58
59	59	119	179	239	299	360	420	480	541	601	662	723	785	846	59

M	14 d	15 d	16 d	17 d	18 d	19 d	20 d	21 d	22 d	23 d	24 d	25 d	26 d	27 d	M
0	848	910	973	1035	1098	1161	1225	1289	1354	1419	1484	1550	1616	1684	0
1	849	911	974	36	99	63	26	90	55	20	85	51	18	85	1
2	851	913	975	37	1100	64	27	91	56	21	86	52	19	86	2
3	852	914	976	38	01	65	28	92	57	22	87	53	20	87	3
4	853	915	977	39	02	66	29	93	58	23	88	54	21	88	4
5	854	916	978	41	03	67	30	95	59	24	90	56	22	89	5
6	855	917	979	42	05	68	32	96	60	25	91	57	23	90	6
7	856	918	980	43	06	69	33	97	61	26	92	58	24	91	7
8	857	919	981	44	07	70	34	98	62	27	93	59	25	93	8
9	858	920	982	45	08	71	35	99	63	28	94	60	26	94	9
10	859	921	983	1046	1109	1172	1236	1300	1364	1429	1495	1561	1628	1695	10
11	860	922	984	47	10	73	37	01	66	31	96	62	29	96	11
12	861	923	985	48	11	74	38	02	67	32	97	63	30	97	12
13	862	924	986	49	12	75	39	03	68	33	98	64	31	98	13
14	863	925	987	50	13	76	40	04	69	34	99	65	32	99	14
15	864	926	988	51	14	77	41	05	70	35	1500	67	33	1700	15
16	865	927	989	52	15	78	42	06	71	36	02	68	34	01	16
17	866	928	990	53	16	79	43	07	72	37	03	69	35	03	17
18	867	929	991	54	17	81	44	08	73	38	04	70	37	04	18
19	868	930	992	55	18	82	45	10	74	39	05	71	38	05	19
20	869	931	994	1056	1119	1183	1246	1311	1375	1440	1506	1572	1639	1706	20
21	870	932	995	57	20	84	48	12	76	41	07	73	40	07	21
22	871	933	996	58	21	85	49	13	77	43	08	74	41	08	22
23	872	934	997	59	22	86	50	14	79	44	09	75	42	09	23
24	873	935	998	60	23	87	51	15	80	45	10	77	43	10	24
25	874	936	999	61	25	88	52	16	81	46	11	78	44	12	25
26	875	937	1000	63	26	89	53	17	82	47	13	79	45	13	26
27	876	938	1001	64	27	90	54	18	83	48	14	80	47	14	27
28	877	939	1002	65	28	91	55	19	84	49	15	81	48	15	28
29	878	941	1003	66	29	92	56	20	85	50	16	82	49	16	29
30	879	942	1004	1067	1130	1193	1257	1321	1386	1451	1517	1583	1650	1717	30
31	880	943	05	68	31	94	58	22	87	52	18	84	51	18	31
32	881	944	06	69	32	95	59	24	88	53	19	85	52	20	32
33	883	945	07	70	33	96	60	25	89	55	20	86	53	21	33
34	884	946	08	71	34	97	61	26	90	56	21	88	54	22	34
35	885	947	09	72	35	99	62	27	92	57	22	89	56	23	35
36	886	948	10	73	36	1200	64	28	93	58	24	90	57	24	36
37	887	949	11	74	37	01	65	29	94	59	25	91	58	25	37
38	888	950	12	75	38	02	66	30	95	60	26	92	59	26	38
39	889	951	13	76	39	03	67	31	96	61	27	93	60	27	39
40	890	952	1014	1077	1140	1204	1268	1332	1397	1462	1528	1594	1661	1729	40
41	891	953	15	78	41	05	68	33	98	63	29	95	62	30	41
42	892	954	16	79	42	06	70	34	99	64	30	96	63	31	42
43	893	955	18	80	44	07	71	35	1400	65	31	98	64	32	43
44	894	956	19	81	45	08	72	36	01	67	32	99	66	33	44
45	895	957	20	82	46	09	73	38	02	68	33	1600	67	34	45
46	896	958	21	83	47	10	74	39	03	69	35	01	68	35	46
47	897	959	22	85	48	11	75	40	05	70	36	02	69	36	47
48	898	960	23	86	49	12	76	41	06	71	37	03	70	38	48
49	899	961	24	87	50	13	77	42	07	72	38	04	71	39	49
50	900	962	1025	1088	1151	1214	1278	1343	1408	1473	1539	1605	1672	1740	50
51	901	963	26	89	52	16	80	44	09	74	40	06	73	41	51
52	902	964	27	90	53	17	81	45	10	75	41	08	75	42	52
53	903	965	28	91	54	18	82	46	11	76	42	09	76	43	53
54	904	966	29	92	55	19	83	47	12	77	43	10	77	44	54
55	905	968	30	93	56	20	84	48	13	79	44	11	78	45	55
56	906	969	31	94	57	21	85	49	14	80	46	12	79	47	56
57	907	970	32	95	58	22	86	50	15	81	47	13	80	48	57
58	908	971	33	96	59	23	87	52	16	82	48	14	81	49	58
59	909	972	34	97	60	24	88	53	18	83	49	15	82	50	59



M	28 d	29 d	30 d	31 d	32 d	33 d	34 d	35 d	36 d	37 d	38 d	39 d	40 d	41 d	M
0	1751	1819	1888	1958	2028	2100	2171	2244	2318	2393	2468	2545	2623	2702	0
1	52	21	90	59	30	01	73	45	19	94	70	46	24	03	1
2	53	22	91	60	31	02	74	47	20	95	71	48	25	04	2
3	55	23	92	62	32	03	75	48	22	96	72	49	27	06	3
4	56	24	93	63	33	04	76	49	23	98	73	50	28	07	4
5	57	25	94	64	34	05	78	50	24	99	75	51	29	08	5
6	58	26	95	65	35	07	79	51	25	2400	76	53	31	10	6
7	59	27	96	66	37	08	80	53	27	01	77	54	32	11	7
8	60	29	98	67	38	09	81	54	28	03	78	55	33	12	8
9	61	30	99	69	39	10	82	55	29	04	80	57	34	14	9
10	1762	1831	1900	1970	2040	2111	2184	2256	2330	2405	2481	2558	2636	2715	10
11	64	32	01	71	41	13	85	58	32	06	82	59	37	16	11
12	65	33	02	72	43	14	86	59	33	08	84	60	38	18	12
13	66	34	03	73	44	15	87	60	34	09	85	62	40	19	13
14	67	35	05	74	45	16	88	61	35	10	86	63	41	20	14
15	68	37	06	76	46	17	90	63	37	11	87	64	42	22	15
16	69	38	07	77	47	19	91	64	38	13	89	66	44	23	16
17	70	39	08	78	48	20	92	65	39	14	90	67	45	24	17
18	72	40	09	79	50	21	93	66	40	15	91	68	46	26	18
19	73	41	10	80	51	22	94	68	42	16	92	69	48	27	19
20	1774	1842	1911	1981	2052	2123	2196	2269	2343	2418	2494	2571	2649	2728	20
21	75	43	13	83	53	25	97	70	44	19	95	72	50	29	21
22	76	45	14	84	54	26	98	71	45	20	96	73	51	31	22
23	77	46	15	85	56	27	99	72	46	21	98	75	53	32	23
24	78	47	16	86	57	28	2200	74	48	23	99	76	54	33	24
25	80	48	17	87	58	29	02	75	49	24	2500	77	55	35	25
26	81	49	18	88	59	31	03	76	50	25	01	78	57	36	26
27	82	50	20	90	60	32	04	77	51	27	03	80	58	37	27
28	83	52	21	91	61	33	05	79	53	28	04	81	59	39	28
29	84	53	22	92	63	34	07	80	54	29	05	82	61	40	29
30	1785	1854	1923	1993	2064	2135	2208	2281	2355	2430	2506	2584	2662	2742	30
31	86	55	24	94	65	37	09	82	56	32	08	85	63	43	31
32	87	56	25	95	66	38	10	83	58	33	09	86	65	44	32
33	89	57	27	97	67	39	11	85	59	34	10	88	66	46	33
34	90	58	28	98	69	40	13	86	60	35	12	89	67	47	34
35	91	60	29	99	70	41	14	87	61	37	13	90	69	48	35
36	92	61	30	2000	71	43	15	88	63	38	14	91	70	50	36
37	93	62	31	01	72	44	16	90	64	39	15	93	71	51	37
38	94	63	32	02	73	45	17	91	65	40	17	94	73	52	38
39	95	64	34	04	75	46	19	92	66	42	18	95	74	54	39
40	1797	1865	1935	2005	2076	2147	2220	2293	2368	2443	2519	2597	2675	2755	40
41	98	66	36	06	77	49	21	95	69	44	21	98	76	56	41
42	99	68	37	07	78	50	22	96	70	45	22	99	78	58	42
43	1800	69	38	08	79	51	24	97	71	47	23	2601	79	59	43
44	01	70	39	10	80	52	25	98	73	48	24	02	80	60	44
45	02	71	41	11	82	53	26	99	74	49	26	03	82	62	45
46	03	72	42	22	83	55	27	2301	75	51	27	04	83	63	46
47	05	73	43	13	84	56	28	02	76	52	28	06	84	64	47
48	06	75	44	14	85	57	30	03	78	53	30	07	86	66	48
49	07	76	45	15	86	58	31	04	79	54	31	08	87	67	49
50	1808	1877	1946	2017	2088	2159	2232	2306	2380	2456	2532	2610	2688	2768	50
51	09	78	48	18	89	61	33	07	81	57	33	11	90	70	51
52	10	79	49	19	90	62	35	08	83	58	35	12	91	71	52
53	11	80	50	20	91	63	36	09	84	59	36	14	92	72	53
54	13	81	51	21	92	64	37	11	85	61	37	15	94	74	54
55	14	83	52	22	94	65	38	12	86	62	38	16	95	75	55
56	15	84	53	24	95	67	39	13	88	63	40	17	96	76	56
57	16	85	55	25	96	68	41	14	89	64	41	19	98	78	57
58	17	86	56	26	97	69	42	16	90	66	42	20	99	79	58
59	18	87	57	27	98	70	43	17	91	67	44	21	2700	80	59

M	42 d	43 d	44 d	45 d	46 d	47 d	48 d	49 d	50 d	51 d	52 d	53 d	54 d	55 d	M
0	2782	2863	2946	3030	3116	3203	3292	3382	3474	3569	3665	3764	3865	3968	0
1	83	64	47	31	17	04	93	84	76	70	67	65	66	70	1
2	84	66	49	33	18	06	95	85	78	72	68	67	68	71	2
3	86	67	50	34	20	07	96	87	79	74	70	69	70	73	3
4	87	69	51	36	21	09	98	88	81	75	72	70	71	75	4
5	88	70	53	37	23	10	99	90	82	77	73	72	73	77	5
6	90	71	54	38	24	12	3301	91	84	78	75	74	75	78	6
7	91	73	56	40	26	13	02	93	85	80	77	75	77	80	7
8	92	74	57	41	27	14	03	94	87	82	78	77	78	82	8
9	94	75	58	43	29	16	05	96	88	83	80	79	80	84	9
10	2795	2877	2960	3044	3130	3217	3306	3397	3490	3585	3681	3780	3882	3985	10
11	97	78	61	46	31	19	08	99	92	86	83	82	83	87	11
12	98	80	63	47	33	20	09	3400	93	88	85	84	85	89	12
13	99	81	64	48	34	22	11	02	95	90	86	85	87	91	13
14	2801	82	65	50	36	23	12	03	96	91	88	87	89	92	14
15	02	84	67	51	37	25	14	05	98	93	90	89	90	94	15
16	03	85	68	53	39	26	16	07	99	94	91	90	92	96	16
17	05	86	70	54	40	28	17	08	3501	96	93	92	94	98	17
18	06	88	71	55	42	29	19	10	03	98	95	94	95	99	18
19	07	89	72	57	43	31	20	11	04	99	96	95	97	4001	19
20	2809	2891	2974	3058	3144	3232	3322	3413	3506	3601	3698	3797	3899	4003	20
21	10	92	75	60	46	34	23	14	07	02	99	99	3901	05	21
22	11	93	76	61	47	35	25	16	09	04	3701	3800	02	06	22
23	13	95	78	63	49	37	26	17	10	06	03	01	04	08	23
24	14	96	79	64	50	38	28	19	12	07	04	04	06	10	24
25	15	97	81	65	52	40	29	20	14	09	06	06	07	12	25
26	17	99	82	67	53	41	31	22	15	10	08	07	09	14	26
27	18	2900	83	68	55	42	32	23	17	12	09	09	11	15	27
28	20	02	85	70	56	44	34	25	18	14	11	11	13	17	28
29	21	03	86	71	57	45	35	27	20	15	13	12	14	19	29
30	2822	2904	2988	3073	3159	3247	3337	3428	3521	3617	3714	3814	3916	4021	30
31	24	06	89	74	60	48	38	30	23	18	16	16	18	22	31
32	25	07	91	75	62	50	40	31	25	20	17	17	19	24	32
33	26	08	92	77	63	51	41	33	26	22	19	19	21	26	33
34	28	10	93	78	65	53	43	34	28	23	21	21	23	28	34
35	29	11	95	80	66	54	44	36	29	25	22	22	25	29	35
36	30	13	96	81	68	56	46	37	31	26	24	24	26	31	36
37	32	14	98	83	69	57	47	39	32	28	26	26	28	33	37
38	33	15	99	84	71	59	49	40	34	30	27	27	30	35	38
39	34	17	3000	85	72	60	50	42	36	31	29	29	32	37	39
40	2836	2918	3002	3087	3173	3262	3352	3443	3537	3633	3731	3831	3933	4038	40
41	37	19	03	88	75	63	53	45	39	34	32	32	35	40	41
42	39	21	05	90	76	65	55	47	40	36	34	34	37	42	42
43	40	22	06	01	78	66	56	48	42	38	36	36	38	44	43
44	41	24	07	93	79	68	58	50	43	39	37	38	40	45	44
45	43	25	09	94	81	69	59	51	45	41	39	39	42	47	45
46	44	26	10	95	82	71	61	53	47	43	41	41	44	49	46
47	45	28	12	97	84	72	62	54	48	44	43	43	45	51	47
48	47	29	13	98	85	74	64	56	50	46	44	44	47	52	48
49	48	31	14	3100	87	75	65	57	51	47	46	46	49	54	49
50	2849	2932	3016	3101	3188	3277	3367	3459	3553	3649	3747	3848	3951	4056	50
51	51	33	17	03	90	78	68	60	55	51	49	49	52	58	51
52	52	35	19	04	91	80	70	62	56	52	50	51	54	60	52
53	54	36	20	05	92	81	71	64	58	54	52	53	56	61	53
54	55	37	21	07	94	83	73	65	59	55	54	54	58	63	54
55	56	39	23	08	95	84	74	67	60	57	55	56	59	65	55
56	58	40	24	10	97	86	76	68	62	59	57	58	61	67	56
57	59	42	26	11	98	87	78	70	64	60	59	60	63	69	57
58	60	43	27	13	3200	89	79	71	65	62	60	61	64	70	58
59	62	44	28	14	01	90	81	73	67	64	62	63	66	72	59



N	56 d	57 d	58	9 d	60 d	61 d	62 d	63 d	64 d	65 d	66	7 d	68 d	69 d	V
0	4074	4183	4294	439	4527	4649	4775	4905	5039	5179	5324	5474	5631	5795	0
1	76	84	96	11	29	51	77	07	42	81	26	77	33	97	1
2	77	86	98	13	31	53	79	09	44	84	28	79	36	5800	2
3	79	88	4300	15	33	55	81	12	46	86	31	82	38	03	3
4	81	90	02	17	35	57	84	14	49	88	33	84	41	06	4
5	83	92	04	19	37	60	86	16	51	91	36	87	44	09	5
6	85	94	06	21	39	62	88	18	53	93	38	89	47	10	6
7	86	95	08	23	41	64	90	20	55	95	41	92	50	14	7
8	88	97	09	25	43	66	92	23	58	98	43	95	53	17	8
9	90	99	11	27	45	68	94	25	60	5200	46	97	56	20	9
10	4092	4201	4313	4429	4547	4670	4796	4927	5062	5203	5348	5500	5658	5823	10
11	94	03	15	31	49	72	98	29	65	05	51	02	60	25	11
12	95	05	17	33	51	74	4801	31	67	07	53	05	62	28	12
13	97	07	19	34	53	76	03	34	69	10	56	07	64	31	13
14	99	08	21	36	55	78	05	36	71	12	58	10	66	34	14
15	4101	10	23	38	57	80	07	38	74	14	61	13	71	37	15
16	03	12	25	40	59	82	09	40	76	17	63	15	74	39	16
17	04	14	27	42	62	84	11	43	78	19	66	18	76	42	17
18	06	16	28	44	64	87	14	45	81	22	68	20	79	45	18
19	08	18	30	46	66	89	16	47	83	24	71	23	82	48	19
20	1110	4220	4332	4448	4568	4691	4818	4949	5085	5226	5373	5526	5685	5851	20
21	12	21	34	50	70	93	20	51	88	29	76	28	87	54	21
22	13	23	36	52	72	95	22	54	90	31	78	31	90	56	22
23	15	25	38	54	74	97	24	56	92	34	80	33	93	59	23
24	17	27	40	56	76	99	26	58	95	36	83	36	95	62	24
25	19	29	42	58	78	4701	29	60	97	38	85	39	98	65	25
26	21	31	44	60	80	03	31	63	99	41	88	41	5701	68	26
27	22	32	46	62	82	05	33	65	5102	43	90	44	04	71	27
28	24	34	47	64	84	07	35	67	04	46	93	46	06	74	28
29	26	36	49	66	86	10	37	69	06	48	95	49	09	76	29
30	1128	4238	4351	4468	4588	4712	4839	4972	5108	5250	5398	5552	5712	5879	30
31	30	40	53	70	90	14	42	74	11	53	5401	54	15	82	31
32	32	42	55	72	92	16	44	76	13	55	03	57	17	85	32
33	33	44	57	74	94	18	46	78	15	58	06	59	20	88	33
34	35	46	59	76	96	20	48	81	18	60	08	62	23	91	34
35	37	47	61	78	98	22	50	83	20	63	11	65	25	94	35
36	39	49	63	80	4600	24	52	85	22	65	13	67	28	96	36
37	41	51	65	82	02	26	55	87	25	67	16	70	31	99	37
38	42	53	67	84	04	28	57	90	27	70	18	73	34	5502	38
39	44	55	69	86	06	31	59	92	29	72	21	75	36	05	39
40	4146	4257	4370	4488	4608	4733	4861	4994	5132	5275	5423	5578	5739	5908	40
41	48	59	72	90	10	35	63	96	34	77	26	80	42	11	41
42	50	60	74	92	12	37	65	99	36	80	28	83	45	14	42
43	52	62	76	94	14	39	68	5001	39	82	31	86	47	17	43
44	53	64	78	95	16	41	70	03	41	84	33	88	50	19	44
45	55	66	80	97	18	43	72	05	43	87	36	91	53	22	45
46	57	68	82	99	20	45	74	08	46	89	38	94	56	25	46
47	59	70	84	4501	23	47	76	10	48	92	41	96	58	28	47
48	61	72	86	03	25	50	79	12	51	94	43	99	61	31	48
49	62	74	88	05	27	52	81	14	53	97	46	5602	64	34	49
50	4164	4275	4390	4507	4629	4754	4883	5017	5155	5299	5448	5604	5767	5937	50
51	66	77	92	09	31	56	85	19	58	5301	51	07	70	40	51
52	68	79	94	11	33	58	87	21	60	04	54	10	72	43	52
53	70	81	96	13	35	60	90	23	62	06	56	12	75	46	53
54	72	83	98	15	37	62	92	25	65	09	59	15	78	48	54
55	73	85	99	17	39	64	94	28	67	11	61	17	81	51	55
56	75	87	4401	19	41	66	96	30	69	14	64	20	83	54	56
57	77	89	03	21	43	69	98	33	72	16	66	23	86	57	57
58	79	91	05	23	45	71	4901	35	74	19	69	25	89	60	58
59	81	92	07	25	47	73	03	37	76	21	71	28	92	63	59

M	70d	71d	72d	73d	74d	75d	76d	77d	78d	79d	80d	81d	82d	83d	M
0	5966	6146	6335	6534	6746	6970	7210	7467	7745	8046	8375	8739	9145	9606	0
1	69	49	38	38	49	74	14	72	49	51	81	45	53	14	1
2	72	52	41	41	53	78	18	76	54	56	87	52	60	22	2
3	75	55	45	45	57	82	22	81	59	61	93	58	67	31	3
4	78	58	48	48	60	86	27	85	64	67	98	65	74	39	4
5	81	61	51	52	64	90	31	90	69	72	8404	71	82	47	5
6	84	64	54	55	68	94	35	94	74	77	10	78	89	55	6
7	86	67	58	58	71	97	39	98	78	83	16	84	96	64	7
8	89	70	61	62	75	7001	43	7503	83	88	22	91	9203	72	8
9	92	73	64	65	79	05	47	07	88	93	27	97	11	80	9
10	5995	6177	6367	6566	6782	7006	7252	7512	7793	8099	8433	8804	9218	9689	10
11	98	80	71	72	86	13	56	16	98	8104	39	10	25	97	11
12	6001	83	74	76	90	17	60	21	7803	09	45	17	33	9706	12
13	04	86	77	79	93	21	64	25	08	15	51	23	40	14	13
14	07	89	80	83	97	25	68	30	13	20	57	30	48	23	14
15	10	92	84	86	6801	29	73	35	17	25	63	36	55	31	15
16	13	95	87	90	04	33	77	39	22	31	69	43	62	40	16
17	16	98	90	93	08	37	81	44	27	36	74	49	70	48	17
18	19	6201	94	97	12	41	85	48	32	41	80	56	77	57	18
19	22	05	97	6600	15	45	89	53	37	47	86	63	85	65	19
20	6025	6208	6400	6603	6819	7048	7294	7557	7842	8152	8492	8869	9292	9774	20
21	28	11	03	07	23	52	98	62	47	58	98	76	9300	83	21
22	31	14	07	10	26	56	7302	66	52	63	8504	83	07	91	22
23	34	17	10	14	30	60	06	71	57	68	10	89	15	9800	23
24	37	20	13	17	34	64	11	76	62	74	16	96	22	09	24
25	40	23	17	21	38	68	15	80	67	79	22	8903	30	17	25
26	43	26	20	24	41	72	19	85	72	85	28	09	37	26	26
27	46	30	23	28	45	76	23	89	77	90	34	16	45	35	27
28	49	33	27	31	49	80	28	94	82	96	40	23	53	44	28
29	52	36	30	35	53	84	32	99	87	8201	46	30	60	52	29
30	5055	6259	6433	6635	6856	7088	7336	7603	7892	8207	8552	8936	9368	9861	30
31	58	42	37	42	60	92	41	08	97	12	58	43	76	70	31
32	61	45	40	46	64	96	45	12	7902	18	65	50	83	79	32
33	64	49	43	49	68	7100	49	17	07	23	71	57	91	88	33
34	67	52	47	53	71	04	53	22	12	29	77	63	99	97	34
35	70	55	50	56	75	08	58	26	17	34	83	70	9407	9906	35
36	73	58	53	60	79	12	62	31	22	40	89	77	14	15	36
37	76	61	57	63	83	16	66	36	27	45	95	84	22	24	37
38	79	64	60	67	86	20	71	40	32	51	8601	91	30	33	38
39	82	68	63	70	90	24	75	45	37	56	07	98	38	42	39
40	5085	6271	6467	6674	6894	7128	7379	7650	7942	8262	8614	9005	9445	9951	40
41	88	74	70	77	98	32	84	54	48	67	20	12	53	59	41
42	91	77	73	81	6901	36	88	59	53	73	26	18	61	69	42
43	94	80	77	85	05	40	92	64	58	79	32	25	69	78	43
44	97	83	80	88	09	45	97	68	63	84	38	32	77	87	44
45	5100	87	83	92	13	49	7401	73	68	90	44	39	85	9996	45
46	03	90	87	95	17	53	06	78	73	95	51	46	93	10005	46
47	06	93	90	98	20	57	10	83	78	8501	57	53	9501	10015	47
48	09	96	94	6702	24	61	14	87	83	07	63	60	09	10024	48
49	12	99	97	06	28	65	19	92	89	12	69	67	17	10033	49
50	6115	6303	6500	6710	6932	7169	7423	7697	7994	8318	8676	9074	9525	10043	50
51	18	06	04	13	36	73	27	7702	99	24	82	81	33	10052	51
52	21	09	07	17	40	77	32	06	8004	29	88	88	41	10061	52
53	24	12	11	20	43	81	36	11	09	35	95	96	49	10071	53
54	27	15	14	24	47	85	41	16	14	41	8701	9103	57	10080	54
55	30	19	17	28	51	89	45	21	20	47	07	10	65	10089	55
56	33	22	21	31	55	94	49	25	25	52	14	17	73	10099	56
57	36	25	24	35	59	98	54	30	30	58	20	24	81	10108	57
58	40	28	28	38	63	7202	58	35	35	64	26	31	89	10118	58
59	43	32	31	42	66	06	63	40	40	69	33	38	98	10127	59



M	84 d	85 d	86 d	87 d	88 d	89 d	M
0	10137	10765	11533	12522	13916	16300	0
1	147	776	547	541	945	357	1
2	157	788	561	561	974	416	2
3	166	795	576	580	14003	476	3
4	175	811	590	599	033	537	4
5	185	822	605	619	063	599	5
6	195	834	620	639	093	662	6
7	205	846	634	659	123	726	7
8	214	855	649	679	154	792	8
9	224	860	664	695	184	858	9
10	10234	10881	11679	12719	14216	16926	10
11	244	895	694	739	247	996	11
12	254	905	709	759	279	17067	12
13	264	917	724	780	311	139	13
14	273	925	739	801	343	213	14
15	283	941	755	821	376	289	15
16	295	953	770	842	408	366	16
17	303	965	785	863	442	445	17
18	314	978	801	884	475	526	18
19	324	990	816	906	509	609	19
20	10334	11002	11832	12927	14545	17693	20
21	344	014	848	949	578	781	21
22	354	027	863	970	613	870	22
23	364	039	879	992	648	962	23
24	374	052	895	13014	684	18056	24
25	385	064	911	036	720	153	25
26	395	077	927	059	756	252	26
27	405	089	943	081	793	355	27
28	416	102	959	104	830	461	28
29	426	115	976	126	868	570	29
30	10437	11127	11992	13149	14906	18682	30
31	447	140	12008	172	943	799	31
32	457	153	025	195	983	920	32
33	468	166	041	219	15022	19045	33
34	478	179	058	242	062	174	34
35	489	192	075	266	102	309	35
36	500	205	092	290	143	450	36
37	510	218	109	314	184	596	37
38	521	231	126	338	226	745	38
39	532	244	143	362	268	905	39
40	10542	11257	12160	13386	15311	20076	40
41	553	270	177	411	354	255	41
42	564	284	194	437	398	439	42
43	575	297	212	461	442	635	43
44	586	310	229	486	487	845	44
45	597	324	247	511	532	21065	45
46	608	337	264	537	579	305	46
47	619	351	282	563	625	357	47
48	630	365	300	585	673	832	48
49	641	378	318	615	721	22132	49
50	10652	11392	12336	13641	15770	22455	50
51	663	406	354	668	819	22821	51
52	674	420	373	695	869	23226	52
53	685	434	391	721	920	23685	53
54	696	448	409	745	972	24215	54
55	708	462	428	776	16024	24842	55
56	719	476	447	804	078	25609	56
57	730	490	465	832	132	26598	57
58	742	504	484	860	187	27992	58
59	753	518	503	888	243	30375	59

## The Use of the Table of Meridional Parts.

**I**N this Table the first and last Column of every Page Mark'd M, beginning at 0, and ending at 59, contain the Minutes answering to every Degree of Latitude, the other Columns mark'd 1d, 2d, &c. contain the Meridional Parts, answering to the Degree of Latitude they stand under.

So that if you would find the Meridional Parts answering to any Latitude, suppose for Example, the Latitude 51,32, look in the Column under 51d. and right against 32 (in the Column for Minutes) you will find 20, to which prefix 36, the two Figures in the same Column that stand above 20 towards the Left-Hand, and it makes 3620, the Meridional Parts required.

*Two Latitudes being given, to find the Meridional Difference of Latitude.*

*Case 1st,* If both Latitudes be North or both South, subtract the Meridional Parts of the Lesser, from the Meridional Parts of the Greater, the Remainder will be the Meridional Difference of Latitude.

*Case 2d,* If one Latitude be North and the other South, then add their Meridional Parts together, and the Sum will be the Meridional Difference of Latitude.

A TABLE of Amplitudes from the Latitude  
00 Deg. 00 Min. to the Latitude 12 Deg.  
either North or South.

Degrees of Declination.	The Degrees of Latitude.											
	1	2	3	4	5	6	7	8	9	10	11	12
	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M	D MD MD M
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 00	01 00	01 00	01 00	01 00	01 00	01 00	01 00	01 00	01 01	01 01	01 01
2	02 00	02 00	02 00	02 00	02 00	02 00	02 01	02 01	02 01	02 02	02 02	02 02
3	03 00	03 00	03 00	03 00	03 00	03 01	03 01	03 02	03 01	03 03	03 03	03 03
4	04 00	04 00	04 00	04 00	04 01	04 01	04 02	04 03	04 02	04 04	04 04	04 04
5	05 00	05 00	05 00	05 01	05 01	05 02	05 03	05 03	05 04	05 05	05 05	05 07
6	06 00	06 00	06 00	06 01	06 01	06 02	06 03	06 04	06 04	06 06	06 06	06 08
7	07 00	07 00	07 01	07 01	07 02	07 03	07 04	07 05	07 05	07 07	07 07	07 09
8	08 00	08 00	08 01	08 01	08 02	08 03	08 04	08 06	08 06	08 08	08 09	08 11
9	09 00	09 00	09 01	09 01	09 02	09 03	09 04	09 05	09 07	09 09	09 10	09 12
10	10 00	10 00	10 01	10 01	10 02	10 03	10 04	10 05	10 07	10 10	10 11	10 13
11	11 00	11 00	11 01	11 01	11 03	11 03	11 05	11 06	11 08	11 11	11 12	11 15
12	12 00	12 00	12 01	12 01	12 03	12 04	12 05	12 07	12 09	12 12	12 13	12 16
13	13 00	13 00	13 01	13 02	13 03	13 04	13 06	13 08	13 10	13 13	13 15	13 18
14	14 00	14 00	14 01	14 02	14 03	14 04	14 06	14 09	14 10	14 14	14 16	14 19
15	15 00	15 00	15 01	15 02	15 04	15 05	15 07	15 09	15 11	15 15	15 17	15 21
16	16 00	16 01	16 01	16 02	16 04	16 05	16 07	16 09	16 12	16 16	16 18	16 22
17	17 00	17 01	17 01	17 02	17 04	17 05	17 08	17 10	17 13	17 17	17 20	17 23
18	18 00	18 01	18 01	18 02	18 04	18 06	18 08	18 11	18 14	18 18	18 21	18 25
19	19 00	19 01	19 01	19 03	19 04	19 06	19 09	19 11	19 15	19 19	19 22	19 26
20	20 00	20 01	20 02	20 03	20 05	20 07	20 09	20 12	20 16	20 20	20 24	20 28
21	21 00	21 01	21 02	21 03	21 05	21 07	21 10	21 13	21 17	21 21	21 25	21 29
22	22 00	22 01	22 02	22 03	22 05	22 07	22 10	22 13	22 17	22 22	22 26	22 31
23	23 00	23 01	23 02	23 03	23 05	23 08	23 11	23 14	23 18	23 23	23 28	23 33
23.29	23 29	23 30	23 31	23 33	23 35	23 38	23 40	23 44	23 49	23 54	23 57	24 02



A TABLE of Amplitudes from the Latitude  
13 Deg. 00 Min. to the Latitude 24 Deg.  
either North or South.

Degrees of Declination.	The Degrees of Latitude.											
	13	14	15	16	17	18	19	20	21	22	23	24
	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD	D MD MD MD MD MD MD MD MD MD MD MD MD
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	02	01	02	01	02	01	03	01	03	01	05
2	02	03	02	03	02	04	02	05	02	06	02	08
3	03	05	03	05	03	06	03	07	03	08	03	10
4	04	06	04	07	04	08	04	10	04	11	04	13
5	05	08	05	09	05	11	05	12	05	13	05	15
6	06	10	06	11	06	13	06	15	06	16	06	18
7	07	11	07	13	07	15	07	17	07	19	07	21
8	08	12	08	15	08	17	08	20	08	22	08	24
9	09	14	09	17	09	19	09	22	09	25	09	27
10	10	15	10	18	10	21	10	24	10	27	10	30
11	11	17	11	20	11	23	11	27	11	30	11	33
12	12	19	12	22	12	25	12	29	12	33	12	36
13	13	21	13	24	13	28	13	32	13	36	13	40
14	14	22	14	26	14	30	14	34	14	39	14	43
15	15	24	15	28	15	32	15	37	15	42	15	47
16	16	26	16	30	16	35	16	40	16	45	16	51
17	17	28	17	32	17	37	17	42	17	48	17	54
18	18	30	18	34	18	40	18	45	18	51	18	57
19	19	31	19	36	19	42	19	48	19	54	20	01
20	20	33	20	38	20	44	20	51	20	57	21	03
21	21	35	21	41	21	46	21	53	21	00	22	05
22	22	37	22	43	22	49	22	56	23	04	23	09
23	23	38	23	45	23	51	23	59	24	07	24	15
24	24	08	24	15	24	22	24	29	24	38	24	46

A TABLE of Amplitudes from the Latitude  
25 Deg. 00 Min. to the Latitude 36 Deg.  
either North or South.

Degrees of Declination.	The Degrees of Latitude.											
	25	26	27	28	29	30	31	32	33	34	35	36
	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 06	01 07	01 07	01 08	01 08	01 09	01 10	01 10	01 11	01 12	01 13	01 14
2	02 12	02 13	02 14	02 16	02 17	02 18	02 20	02 21	02 23	02 25	02 27	02 28
3	03 18	03 20	03 22	03 24	03 25	03 28	03 30	03 33	03 35	03 37	03 40	03 43
4	04 25	04 27	04 29	04 32	04 34	04 37	04 40	04 43	04 46	04 50	04 53	04 57
5	05 31	05 33	05 36	05 40	05 43	05 46	05 50	05 54	05 58	06 02	06 06	06 11
6	06 37	06 41	06 44	06 48	06 52	06 56	07 00	07 04	07 09	07 13	07 20	07 25
7	07 43	07 48	07 51	07 56	08 00	08 05	08 10	08 16	08 21	08 27	08 33	08 39
8	08 50	08 54	08 59	09 04	09 09	09 15	09 21	09 27	09 33	09 39	09 47	09 54
9	09 36	10 01	10 06	10 12	10 18	10 24	10 31	10 37	10 45	10 52	11 00	11 09
10	11 02	11 07	11 14	11 20	11 26	11 33	11 41	11 48	11 56	12 04	12 13	12 23
11	12 09	12 15	12 22	12 29	12 36	12 43	12 52	13 00	13 09	13 18	13 28	13 38
12	13 16	13 23	13 29	13 37	13 45	13 53	14 02	14 11	14 21	14 31	14 42	14 53
13	14 23	14 31	14 38	14 46	14 54	15 03	15 13	15 23	15 33	15 44	15 56	16 09
14	15 29	15 37	15 45	15 54	16 03	16 13	16 23	16 34	16 45	16 57	17 11	17 24
15	16 35	16 44	16 53	17 03	17 12	17 23	17 34	17 46	17 58	18 11	18 25	18 39
16	17 42	17 51	18 01	18 11	18 22	18 33	18 45	18 58	19 11	19 25	19 39	19 55
17	18 49	18 59	19 09	19 20	19 31	19 43	19 56	20 10	20 24	20 39	20 54	21 11
18	19 56	20 06	20 17	20 29	20 41	20 54	21 08	21 22	21 37	21 53	22 10	22 27
19	21 03	21 14	21 26	21 38	21 51	22 05	22 19	22 34	22 50	23 07	23 25	23 43
20	22 10	22 22	22 34	22 48	23 0	23 16	23 31	23 47	24 04	24 21	24 40	25 00
21	23 18	23 30	23 43	23 57	24 11	24 27	24 43	25 00	25 18	25 36	25 56	26 18
22	24 24	24 38	24 51	25 06	25 22	25 38	25 55	26 13	26 32	26 51	27 13	27 35
23	25 32	25 46	26 00	26 16	26 32	26 49	27 07	27 26	27 46	28 07	28 29	28 53
24	26 05	26 19	26 34	26 49	27 06	27 23	27 42	28 01	28 22	28 44	29 06	29 30



A TABLE of Amplitudes from the Latitude  
37 Deg. 00. Min. to the Latitude 48 Deg.  
either North or South.

Degrees of Declination.		The Degrees of Latitude.																							
		37		38		39		40		41		42		43		44		45		46		47		48	
		D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
0		00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
1		01	15	01	16	01	17	01	18	01	19	01	21	01	22	01	23	01	25	01	26	01	28	01	29
2		02	30	02	32	02	34	02	36	02	39	02	41	02	44	02	47	02	50	02	53	02	56	02	59
3		03	45	03	48	03	51	03	55	03	58	04	02	04	06	04	10	04	15	04	19	04	24	04	29
4		05	00	05	05	05	08	05	13	05	18	05	23	05	28	05	34	05	40	05	56	05	52	05	59
5		06	15	06	21	06	26	06	32	06	38	06	44	06	51	06	58	07	05	07	12	07	20	07	29
6		07	31	07	37	07	43	07	50	07	57	08	05	08	13	08	21	08	30	08	39	08	49	08	59
7		08	46	08	54	09	01	09	09	09	17	09	26	09	35	09	45	09	56	10	06	10	18	10	30
8		10	02	10	11	10	19	10	28	10	37	10	47	10	58	11	09	11	21	11	34	11	47	12	00
9		11	17	11	27	11	37	11	47	11	57	12	09	12	21	12	34	12	47	13	01	13	16	13	31
10		12	32	12	43	12	54	13	05	13	18	13	31	13	44	13	58	14	13	14	28	14	44	15	02
11		13	49	14	01	14	12	14	25	14	39	14	53	15	07	15	22	15	38	15	56	16	15	16	34
12		15	05	15	18	15	31	15	45	16	00	16	15	16	31	16	48	17	06	17	25	17	45	18	06
13		16	21	16	35	16	49	17	05	17	20	17	37	17	55	18	13	18	33	18	54	19	16	19	39
14		17	38	17	53	18	08	18	24	18	42	19	00	19	19	19	39	20	00	20	22	20	47	21	12
15		18	54	19	10	19	27	19	44	20	04	20	23	20	43	21	05	21	28	21	52	22	18	22	45
16		20	11	20	28	20	46	21	05	21	25	21	46	22	08	22	32	22	56	23	23	23	50	24	20
17		21	28	21	46	22	06	22	26	22	47	23	10	23	34	23	59	24	25	24	53	25	23	25	55
18		22	46	23	05	23	26	23	47	24	10	24	34	24	59	25	26	25	54	26	25	26	57	27	31
19		24	03	24	24	24	45	25	09	25	33	25	58	26	25	26	54	27	25	27	58	28	32	29	67
20		25	21	25	43	26	06	26	31	26	56	27	24	27	53	28	23	28	56	29	31	30	07	30	45
21		26	39	27	02	27	27	27	53	28	21	28	50	29	20	29	53	30	27	31	03	31	42	32	22
22		27	58	28	23	28	49	29	16	29	45	30	16	30	48	31	22	31	58	32	37	33	18	34	01
23		29	17	29	43	29	11	30	40	31	11	31	41	32	16	32	51	33	30	34	12	34	56	35	43
23-29		29	56	30	22	30	50	31	20	31	52	32	28	33	03	33	40	34	20	35	03	35	48	36	35

A TABLE of Amplitudes, from the Latitude  
49 Deg. 00 Min. to the Latitude 60 Deg. either  
North or South.

Degrees of Declination.	The Degrees of Latitude.											
	49	50	51	52	53	54	55	56	57	58	59	60
	D M D M D M D M D M D M D M D M D M D M D M											
0	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00	00 00
1	01 31	01 33	01 35	01 37	01 39	01 42	01 45	01 47	01 50	01 53	01 56	02 00
2	03 01	03 06	03 10	03 15	03 20	03 24	03 29	03 34	03 40	03 46	03 53	04 00
3	04 34	04 40	04 46	04 52	04 59	05 06	05 14	05 22	05 31	05 40	05 50	06 00
4	06 06	06 14	06 22	06 30	06 39	06 49	06 59	07 10	07 22	07 34	07 47	08 01
5	07 38	07 48	07 58	08 08	08 19	08 31	08 44	08 57	09 11	09 26	09 43	10 02
6	09 10	09 21	09 31	09 46	10 00	10 15	10 30	10 47	11 04	11 22	11 42	12 04
7	10 42	10 55	11 09	11 24	11 40	11 57	12 15	12 35	12 56	13 18	13 41	14 06
8	12 14	12 29	12 45	13 02	13 21	13 41	14 02	14 24	14 48	15 14	15 41	16 10
9	13 47	14 05	14 24	14 43	15 04	15 26	15 49	16 14	16 45	17 10	17 41	18 14
10	15 21	15 40	16 01	16 23	16 46	17 11	17 37	18 05	18 33	19 07	19 41	20 18
11	16 54	17 16	17 39	18 03	18 29	18 57	19 26	19 56	20 29	21 04	21 43	22 26
12	18 2	18 52	19 18	19 44	20 12	20 43	21 15	21 49	22 25	23 04	23 47	24 34
13	20 03	20 29	20 57	21 26	21 57	22 30	23 05	23 43	24 23	25 07	25 54	26 44
14	21 38	22 06	22 37	23 08	23 42	24 18	24 56	25 37	26 21	27 09	28 01	28 55
15	23 14	23 45	24 18	24 52	25 28	26 07	26 49	27 34	28 22	29 14	30 12	31 09
16	24 51	25 24	25 59	26 36	27 16	27 58	28 43	29 32	30 24	31 21	32 22	33 27
17	26 2	27 03	27 41	28 21	29 04	29 50	30 39	31 31	32 27	33 28	34 32	35 47
18	28 0	28 42	29 24	30 07	30 53	31 42	32 35	33 33	34 34	35 40	36 53	38 09
19	29 4	30 25	31 08	31 55	32 45	33 38	34 35	35 36	36 40	37 54	39 13	40 36
20	31 25	32 08	32 54	33 44	34 39	35 35	36 36	37 42	38 52	40 12	41 37	43 10
21	33 06	33 52	34 41	35 34	36 31	37 32	38 39	39 51	41 09	42 34	44 05	45 48
22	34 48	35 37	36 30	37 27	38 29	39 36	40 47	42 04	43 27	44 59	46 40	48 30
23	36 33	37 26	38 23	39 24	40 29	41 40	42 56	44 19	45 50	47 30	49 21	51 24
23.29	37 26	38 20	39 19	40 23	41 20	42 46	44 00	45 27	47 02	48 46	50 47	52 51



# A TABLE of Amplitudes from the Latitude 61 Deg. 00 min. to the Latitude 66 deg. either North or South.

Degrees of Declination	The Degrees of Latitude.							The Use of the TABLES of Amplitudes.
	61	62	63	64	65	66		
	D	MD	MD	MM	DM	DD	M	
0 00	00 00	00 00	00 00	00 00	00 00	00 00	00	<p>The Amplitude of the Sun or any Star, is so many Degrees Distance as they rise or set from the East or West Points of the Horizon, either Northerly or Southerly.</p>
1 02	03 02	07 02	12 02	17 02	22 02	27 02	27	
2 04	08 04	15 04	24 04	33 04	44 04	55 04	55	
3 06	12 06	24 06	37 06	51 07	06 07	23 07	23	
4 08	17 08	32 08	50 09	09 09	30 09	52 09	52	
5 10	21 10	41 11	04 11	28 11	54 12	22 12	22	<p><i>Note,</i> When the Sun or Stars hath North Declination, then the Amplitude found by these Tables must be reckoned from the East toward the North at their Rising, or from the West toward the North at their Setting.</p>
6 12	27 12	52 13	19 13	47 14	19 14	53 14	53	
7 14	34 15	02 15	34 16	08 16	45 17	26 17	26	
8 16	40 17	14 17	51 18	30 19	13 20	00 20	00	
9 18	49 19	28 20	09 20	54 21	43 22	37 22	37	
10 20	57 21	40 22	27 23	18 24	13 25	14 25	14	<p>But if they have South Declination, then the Amplitude must be reckoned from the East toward the South at their Rising, or from the West toward the South at their Setting.</p>
11 23	10 23	58 24	51 25	48 26	50 27	58 27	58	
12 25	22 26	17 27	15 28	19 29	28 30	44 30	44	
13 27	39 28	37 29	42 30	52 32	09 33	34 33	34	
14 29	56 31	01 32	12 33	30 34	55 36	29 36	29	
15 32	16 33	27 34	45 36	11 37	46 39	31 39	31	<p><i>To find the true Amplitude by the Tables.</i></p>
16 34	39 35	57 37	23 38	57 40	42 42	40 42	40	
17 37	05 38	31 40	05 41	49 43	46 45	58 45	58	
18 39	36 41	10 42	54 44	49 46	59 49	26 49	26	
19 42	11 43	54 45	49 47	57 50	23 53	11 53	11	
20 44	52 46	46 48	53 51	17 54	02 57	14 57	14	<p>Look for the given Latitude at the Top of the Table, and the Declination in the first Column to the Left-hand, and in the common Angle of Meeting you will find the Amplitude required, in Degrees and Minutes.</p>
21 47	40 44	46 52	07 54	50 57	59 61	47 61	47	
22 50	35 56	56 55	36 58	43 62	26 67	04 67	04	
23 53	42 56	20 59	24 63	02 67	36 73	52 73	52	
23 55	17 58	04 61	22 65	22 70	33 78	25 78	25	

## Rules concerning Amplitudes.

*Case 1st.* **W**HEN the Latitude and Declination are both given in even degrees, as for Example. Suppose I would know the Sun's true Amplitude at his Rising, in the Latitude of 40 00, his Declination being 17 00 N.

Under Latitude 40, and right against Declination 17, I find 22 26, which is the Sun's true Amplitude, to be counted from the East towards the North (because it is at his Rising), and the Declination is North) that is, E. 22 26 N.

*Case 2d.* When the Latitude is given in even Degrees, and the Declination in Degrees and Minutes, as for Example. Suppose I would know the Sun's true Amplitude at his Setting, in the Latitude of 57 00, his Declination being 11 33 S.

Find his Amplitude as before, for the Latitude 57, and for

the Declination  $\left\{ \begin{array}{l} 11 \text{ deg.} \\ 12 \text{ deg.} \end{array} \right\}$  which will be  $\left\{ \begin{array}{l} 20 \ 29 \\ 22 \ 25 \end{array} \right\}$  then

subtract the Lesser from the Greater, the Diff. is 1 56 or 116 min. to which put two Cyphers, and it makes 11600, which Number must be divided by the Number standing against the odd Minutes of Declination (in the following Table) which in this Case is 181, and the Quotient gives the proportional Parts in Minutes, which Parts are always to be added to the Lesser of the two Amplitudes that you took the Difference of, and the Sum gives the true Amplitude as follows.

181)11600(64 Proportional Parts in Minutes.  
740 makes 1 Degree 4 Minutes.  
10

Lesser of the Amplitudes ————— 20 29  
Proportional Parts to be added ————— 01 04  
True Amplitude ————— W. 21 33 S.  
because at Sun-setting, and the Declination South.

*Case 3d.* When the Declination is given in even Degrees, and the Latitude in Degrees and Minutes, as for Example. Suppose I would know the Sun's true Amplitude at his Rising, in the Latitude 51 14, his Declination being 14 00 S.

Find his Amplitude as before, to 14 Degrees Declination, and for the Latitude  $\left\{ \begin{array}{l} 51 \text{ deg.} \\ 52 \text{ deg.} \end{array} \right\}$  which will be  $\left\{ \begin{array}{l} 23 \ 37 \\ 23 \ 08 \end{array} \right\}$  and subtract the Lesser from the Greater, the Difference is 0 31 Minutes.

To



## Rules concerning Amplitudes.

123

To the Difference of Amplitudes found on the foregoing Side, which is 31, put two Cyphers, and make it 3100, which must be divided by the Number standing against the odd Minutes of Latitude (in the following Table) which in this *Case* is 428, and the Quotient gives the proportional Parts in Minutes, to be added to the Lesser of the two Amplitudes, as in *Case* the 2d.

428)3100(7 proportional Parts in Minutes.

104	
Lesser of the Amplitudes	22 37
Proportional Parts to be added	00 07
True Amplitude	E. 22 44 S.

*Case 4th.* When the Latitude and Declination are both given in Degrees and Minutes, as for Example: Suppose I would know the Sun's true Amplitude at his Setting, in the Latitude 49 18, his Declination being 19 41 N.

First find his Amplitude for Latitude 49 Degrees, and Declination 19 41 (as in *Case* the 2d) which will be 30 53.

In the same Manner find his Amplitude for Latitude 50 Degrees, and Declination 19 41, which will be 31 35.

Then from the Greater Amplitude	31 35
Subtract the Lesser	30 53
Remains the Difference	00 42 Minutes.

Put two Cyphers to this Difference it makes 4200, which must be divided by the Numbers standing right against the odd Minutes of the given Latitude in the following Table) which in this *Case* is 333, the Quotient gives the proportional Parts in Minutes, to be added to the Lesser of the two Amplitudes, &c.

333)4200(12 proportional Parts.

870	
204	
The Lesser Amplitude	30 53
Proportional Parts to be added	00 12
True Amp. for Lat. 49 18, and Decl. 19 41 N. W.	31 05 N.

A TABLE of Numbers for finding the proportional Parts to the odd Minutes of Latitude or Declination, in finding the Sun's true Amplitude.

Minutes	Odd	Num- bers.	Minutes	Odd	Num- bers.	Minutes	Odd	Num- bers.	Minutes	Odd	Num- bers.
1		6000	16		575	31		193	46		130
2		3000	17		353	32		187	47		127
3		2000	18		333	33		181	48		125
4		1500	19		316	34		176	49		122
5		1200	20		300	35		171	50		120
6		1000	21		285	36		166	51		118
7		857	22		273	37		162	52		115
8		750	23		261	38		158	53		113
9		666	24		250	39		154	54		111
10		600	25		240	40		150	55		109
11		545	26		230	41		146	56		107
12		500	27		222	42		143	57		105
13		461	28		214	43		139	58		103
14		428	29		207	44		136	59		101
15		400	30		200	45		133			

The Use of this Table is to find a Number to divide the Difference of Amplitudes by, in order to find the proportional Parts, when the Amplitude is required for any Latitude or Declination that is given in Degrees and Minutes, (as in the foregoing Cases) to find which Number, look in some of the Columns under the Title of odd Minutes for your given Minutes of Latitude or Declination; as suppose for 37 Minutes, and right against that you will find 162, which is the Number required.

To



*To find the Variation of the Compass by an Amplitude.*

To do this, you must have given both the true and magnetical Amplitudes.

The true Amplitude is to be found by the Tables as before taught.

The magnetical Amplitude is to be found by the Compass, at the Time of the Sun's rising or setting, and is so many Degrees or Minutes as you see it rise from the East, or to set from the West, either to the Northward or to the Southward: As for Example, Suppose, being at Sea, I find, by setting the Sun with my Compass, that he rises 10 Deg. 15 Min. to the Northward of the East, then the magnetical Amplitude is E. 10 15 N. Or suppose I find by the Compass, that he sets 14 Deg. 12 Min. to the Southward of the West, then the magnetical Amplitude is W. 14 12 S.

Then if your true Amplitude and magnetical Amplitude are both to the Northward, or both to the Southward, subtract the Lesser from the Greater, the Remainder is the Variation.

But if one be to the Northward, and the other to the Southward, add them together, and the Sum will be the Variation. D. M.

<i>Example 1st.</i>	True Amplitude	—	—	E. 18 34 N.
	Magnetical Amplitude	—	—	E. 22 37 N.
	Variation	—	—	04 03 East.

<i>Example 2d.</i>	True Amplitude	—	—	W. 7 11 S.
	Magnetical Amplitude	—	—	W. 2 06 N.
	Variation	—	—	9 17 Westerly.

And thus having found how much the Variation is, it remains in the next Place to find which way it is; that is, whether it be Easterly or Westerly.

*Rule.* If the Amplitude be taken at Sun-rising, and the magnetical Amplitude be farther from the North than the true Amplitude is, then the Variation is Westerly; but if it be nearer to the North, it is Easterly.

If it be taken at Sun-setting, if the magnetical Amplitude be farther from the North than the true Amplitude is, then the Variation is Easterly, but if it be nearer to the North, it is Westerly, as may be seen by the two foregoing Examples.

## Rules for keeping a Journal.

By keeping a Journal, is meant, keeping such an Account of the Ship's Way, that at any Time you may be able to know what Latitude and Longitude the Ship is in.

When a Ship is bound from any one Place to another, that lies so far from it that she is obliged to go out of Sight of the Land for any considerable Time, as suppose from *England* to *Barbadoes*, then at the Time she leaves the Land, she is said to take her Departure, and that Part of the Land she then leaves, as suppose the *Start*, the *Lizard*, the *Land's-End*, &c. is said to be the Place they take their Departure from; and at the Time of taking such Departure, the Captain or Mate generally takes the Bearing and Distance of that Land, according to his Judgment, and sets it down in the Log-board, or in the Log-book, against the Time it was taken thus,

*Lizard*, N. by W. Distance 5 Leagues.  
Or, *Start*, N. N. E. Distance 6 Leagues, &c.

And in the same Manner for any other Place, Bearing, and Distance, as you will see in the first Day's Log, of the following Journal.

The Log-book being marked as follows, with Columns for Course, Distance, Northing and Southing, Easting or Westing, Latitude by Dead Reckoning, Latitude by Observation, Meridian Distance, Longitude made, and Longitude in, you are to take Notice.

That in the Column for Course, you are always to set down the Course you have made by your Reckoning for that 24 Hours (that is from the Noon of the Day before, to the Noon of the Day you work on) the Sea Account being always kept from Noon to Noon.

In the Column for Distance, you are to set down the Distance made by your Reckoning for that 24 Hours.

In the Column of Northing or Southing, you are to set down the Difference of Latitude made that 24 Hours, marking the Column with N. if the Difference of Latitude be Northerly, or with S. if it be Southerly.

In the Column of Easting or Westing, you are to set down the Departure made that 24 Hours, marking the Column with E. if the Departure be Easterly, or with W. if it be Westerly.

In the Column marked Lat. by D. R. you are to set down the Latitude you reckon yourself in on that Day.



## Rules for keeping a Journal.

127

In the Column marked **Lat.** by **Obs.** you are to set down the Latitude you find yourself to **be in** by **Observation**, if you have one, if not, then let it stand open.

In the Column for **Mer. Dist.** you are to set down (in Degrees and Minutes) how much **Departure** you have made in all, from the Place you took your **Departure** from.

In the Column of **Long. made**, you are to set down (in Degrees and Minutes) how much **Difference of Longitude** you have made in all from the Place you took your **Departure** from.

In the Column of **Long. in**, you are to set down what **Longitude** you find yourself to be in on that **Day** by your **Reckoning**.

*Note*, The Account of **Longitude made**, being what is always kept in his Majesty's Navy. And the Account of **Longitude in**, being most generally kept on Board the Merchant Ships: I shall in this Treatise shew how to keep them both, and shall leave it to the Practitioner's Choice which he will make use of, they both being equally true, and there being no Occasion to keep more than one of them.

And not having (I think) given a sufficient Account of Things that are to be set down in the several Columns, I shall lay down these few necessary Rules following, and then proceed to shew how they are all to be found, or the Method of working a Day's Work at Sea.

*Rule 1<sup>st</sup>.* Variation, if there be any (as most commonly there is) must be allowed upon all Courses steered, and upon all Bearings, &c. that are taken by the Compass; that is, if it be Easterly Variation, it must be allowed to the Right-hand; but if Westerly Variation, then to the Left-hand of the Course or Bearing: Supposing yourself placed in the Center of the Compass, and looking directly forward to the Point you are to allow the Variation from.

*Example.* Suppose I steer S. W. and there is one Point Westerly Variation, then my true Course will be S. W. by S. or suppose I set a Point of Land, and find it to bear by my Compass E. S. E. and I know there is half a Point Easterly Variation, then the true Bearing is S. by E.  $\frac{1}{2}$  E.

*Rule 2<sup>d</sup>.* Lee-way (which I shall not here describe, because sufficiently known to every Seaman) must be allowed to the Right-hand of the Course steered, when the Larboard Tacks are aboard, and to the Left-hand when the Starboard Tacks are aboard.

Ex-

## Rules for keeping a Journal.

*Example.* Suppose I steer N. E. by E. with my Larboard Tacks aboard, and make one Point Lee-way, then my Course made good is E. N. E.

*Rule 3d.* Lee-way and Variation, when they are both to be allowed one Way, that is, both to the Right-hand or both to the Left, add them together, and allow their Sum the same Way they were to be allowed.

But if they are to be allowed, one to the Right-hand, and the other to the Left, subtract the Lesser from the Greater, and allow the Remainder the same Way as the Greater of them was to be allowed.

*Example.* Suppose I steer N.N.W. with my Starboard Tacks aboard, and make one Point Lee-way, there being at the same Time half a Point westerly Variation, I would know my true Course?

Lee-way to the Left-hand	_____	1	0 Point.
Variation to the Left-hand	_____	0	$\frac{1}{2}$ Point.

Their Sum to be allowed to the Left-hand  $\frac{1}{2}$  Point, makes the true Course N. by W. N.  $\frac{1}{2}$  W.

*Example 2d.* Suppose I steer S. W. by W. with my Larboard Tacks aboard, and makes  $2\frac{1}{2}$  Points Lee-way, and I have  $1\frac{1}{2}$  Points Westerly Variation, what is my true Course?

Lee-way to the Right-hand	_____	2	$\frac{1}{2}$ Points.
Variation to the Left-hand	_____	1	$\frac{1}{4}$

The Remainder to be allowed to the Right-hand  $\frac{1}{4}$  Points, makes the true Course W. S. W.  $\frac{1}{4}$  W.

*Rule 4th,* When a Ship is lying too under a Main-sail, Mizzen, &c. then observe how she comes up and falls off, and take the Middle between the two Points, and from that allow the Lee-way and Variation, as in Rule 3d.

*Example.* Suppose a Ship lying too under a Main-sail, with the Starboard Tack aboard, comes up E. by S. and falls off to N. E. by E. there being one Point Westerly Variation, and she makes five Points Lee-way, what Course does she make good?

The Middle between E. by S. and N. E. by E. is E. by N. from which allowing six Points to the Left-hand, (by Rule 3d.) the true Course will be N. by E.

*Rule 5th,* Currents, the Way they set you, and the Distance you suppose you are driven by them, is to be set in the Traverse-Table for the Day, as any other Course or Distance:

*Ex:*



## Rules for keeping a Journal.

129

*Example.* Suppose I try the Current and find it to set W. by N. *per* Compass 1 Mile *per* Hour, the Variation being one Point Easterly, then if I sail in that Current 24 Hours, I set down in the Traverse Table, as a Course, W. N. W. distant 24 Miles.

*Rule 6th.* Heave of the Sea is to be accounted for in the same Manner as Currents: As suppose there is a great Sea heaving toward the SW. by my Compass, there being  $\frac{1}{2}$  Point Westerly Variation, I then set down in my Traverse-Table SW. by S.  $\frac{1}{2}$  W. with so much Distance as I judge the Sea has heaved the Ship.

*Rule 7th.* At leaving the Land, the opposite Point to the Bearing (with the Variation allowed upon it) and the Distance you judge yourself from it, must be set down in the Traverse-Table, as a Course and Distance.

*Example.* Suppose, having  $1\frac{1}{4}$  Westerly Variation, the *Start* bears by my Compass N.N.E. distant 4 Leagues. The opposite Point to N.N.E. is S.S.W. which with the Variation makes S.  $\frac{3}{4}$  W. for the Course to be set by the Traverse-Table, distant 12 Miles.

*Rule 8th.* When you make the Land, the Bearing itself (with the Variation allowed upon it) and the Distance you judge yourself from it are to be set in the Traverse-Table, as a Course and Distance: This needs no Example.

*Note,* If you keep only the Account of Longitude made, and would at any Time know what Longitude you are in, look out the Longitude of the Place you took your Departure from, and with that Longitude, and the Longitude made, taken as Difference of Longitude, find the Longitude come into, by the Rules in Page 107 and 108. And the Longitude so found must be counted from the same Meridian that the Tables you look'd out the Longitude of the Place departed from, counts it.

## 130 Rules to correct the Dead-Reckoning

*RULES to correct the Dead-Reckoning by an Observation.*

**W**HEN you have made all the proper Allowances you can, such as for Variation, Lee-way, Currents, &c. and still find that your Latitude by Dead-Reckoning will not agree with the Latitude by Observation, within five Minutes, then you must correct as follows.

### CASE the First.

*If your Course found by Dead-Reckoning be due North, or due South.*

*Rule.* First find the Difference of Latitude (in Miles) between the last Observation, and the Observation on the Day you correct, which will be the true Difference of Latitude, then will your true Course be the same as the Course by Dead-Reckoning. Your true Distance the same as the true Difference of Latitude. Your Departure 00, and your Meridian Distance, Longitude made, (or Longitude in) will be the same as they were on the Day you had the last Observation.

### CASE the Second.

*If the Course found by Dead-Reckoning be less than three Points, or thirty-three Degrees.*

*Rule.* First find the Difference of Latitude (in Miles) between the last Observation, and the Observation on the Day you correct, which will be the true Difference of Latitude. Then make your true Course the same as the Course found by Dead-Reckoning, since the last Observation, and with that Course, and the true Difference of Latitude, find the true Distance and Departure (*as in Plane-Sailing, Case the Second*) then to find the Meridian Distance, the Longitude made, and the Longitude in, take the following Rule.

*N. B.* The Difference of Longitude is to be found by the true Course, and the Meridional Difference of Latitude between the two Observations (as usual) and the Meridian Distance, Longitude made (or Longitude in) are to be found by adding or subtracting the true Departure and Difference of Longitude to, or from the Meridian Distance, Longitude made (or Longitude in) on the Day you had the last Observation, which is the Day you always correct from.

CASE



## C A S E the Third.

*If the Course found by Dead-Reckoning be more than three Points, or thirty-three Degrees, and less than six Points, or sixty-seven Degrees.*

*Rule.* First find the Difference of Latitude in Miles between the last Observation, and the Observation on the Day you correct, which will be the true Difference of Latitude : Then with the Course found by Dead-Reckoning, since the last Observation, and the true Difference of Latitude, find a new Departure (*by the Second Case of Plane Sailing*) add this new Departure to the Departure found by Dead-Reckoning since the last Observation, and take half their Sum for your true Departure : Then you have given the true Difference of Latitude and Departure to find your true Course and Distance, (*by Plane Sailing, Case 6th*) read here *N. B.* in Case the 2d.

## C A S E the Fourth.

*If the Course found by Dead-Reckoning be more than six Points, or sixty-seven Degrees.*

*Rule.* First find the Difference of Latitude in Miles between the last Observation, and the Observation on the Day you correct, which will be the true Difference of Latitude, and make your true Departure the same, as the Departure found by Dead-Reckoning since the last Observation : Then you have given the true Difference of Latitude and Departure, to find the true Course and Distance (*by Plane Sailing, Case 2d*) read here the *N. B.* in Case the 2d.

*Note,* As the Knowledge of which Case you are to correct by depends upon knowing your Course by Dead-Reckoning, and as when you correct only for one Day, that Course is always found by the Difference of Latitude and Departure in your Traverse-Table for that Day ; therefore if you are to correct for a longer Time than one Day, you must take the Northing, Southing, Easting and Westing that you have made for every Day since the last Observation, (or if it be your first Observation, then for every Day from your leaving the Land) minding not to leave out the Difference of Latitude and Departure for the Day you are correcting on, and bring them into a Traverse-Table ; by which you will find the whole Difference of Latitude and Departure, made by Dead-Reckoning since the last Observation, and with that same Difference of Latitude and Departure find

## 132 Rules to correct the Dead-Reckoning, &c.

find the Course made by Dead-Reckoning, then observe which of the foregoing Cases that Course comes under, and correct by the Rules for that Case, finding every thing except the Distance.

And when you have so corrected, you are to set down in your Book only the Latitude by Dead-Reckoning, the Latitude by Observation, the Meridian Distance and the Longitude made (or Longitude in) and rub out the Course, Difference of Latitude and Departure.

Then you have given the Latitude by Observation on the Day you correct, and the Latitude by Dead-Reckoning on the Day before it, to find the Difference of Latitude for the last 24 Hours (by the Rules for Latitude, Page 105.) Also the Meridian Distance on the Day you correct, and the Meridian Distance on the Day before it, to find your Departure, (by subtracting the Less from the Greater, if they are both East, or both West; or by adding them together, if one be East and the other West.) And with that Difference of Latitude and Departure find your Course and Distance (*by the 6th Case of Plane Sailing*) which Course, Distance, Difference of Latitude and Departure are to be set down instead of those you rubbed out.

### *Rules to find the Meridian Distance.*

*Case 1st.* If the Meridian Distance on the Day you work from be East, and you have sail'd to the Eastward; or if it be West, and you have sail'd to the Westward, then add the Departure to the Meridian Distance, and the Sum will be the Meridian Distance you have made, of the same Name with that you work'd from.

*Example.* Meridian Distance ——— 4 18 W.  
 Departure Westerly 97 Miles, or — 1 37  
 Meridian Distance made in all — 5 55 W.

*Case 2d.* If your Meridian Distance be East, and the Departure be Westerly; or if the Meridian Distance be West, and Departure Easterly, then subtract the Less from the Greater, the Remainder will be the Meridian Distance you have made, of the same Name with the Greater of the two.

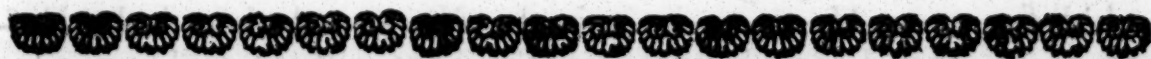
*Example 1st.* Meridian Distance ——— 7 34 W.  
 Departure Easterly ——— 1 16  
 Meridian Distance made in all - 6 18 W.

*Example 2d.* Meridian Distance ——— 1 34 W.  
 Departure Easterly ——— 3 17  
 Meridian Distance made in all - 1 43 E.





A  
JOURNAL  
OF  
A Voyage from ENGLAND  
TOWARDS  
MADRID A.



N R

H	K.	H K F.	Courses	Winds	Lee-way.	Transactions, <i>Thursday</i> , <i>May</i> the 13th, 1771.		
2				N.		Moderate Gales and fair Weather, at 6 (p. m.) the <i>Start</i> bore as per Long. from which I take my Departure, it being in the Latitude 50 07 N. and Longitude of 3.47 W. from <i>London</i> .		
4								
6								
8	4			SW by W.	N. E.			
10	4	1						
12	5							
2	5							
4	5	1		S. W.				
6	5	1						
8	5	1						
10	5	1						
12	6							
						Variation 1 $\frac{1}{4}$ Point W. erly.		
Course	Dist. S.	W	Lat. by D. R.	Lat. by Ob	Mer. Dist.	Lon. made	Lon. in	
S 30 00 W	108 93	53	48 34 N.		00 53 W.	01 22 W.	05 09 W	

*The Manner of working this Day's Work.*

The opposite Point to the Bearing of the Land is S. by W. which with the Variation allow'd upon it (as before taught) makes S  $\frac{1}{4}$  E. and the Distance from the Land 6 Leagues, or 18 Miles, which are to be set down for the first Course and Distance in the following Traverse-Table.

Then the first Course steer'd being S. W. by W. the Variation allow'd upon it will make it SW. by S.  $\frac{1}{4}$  W. and the Sum of all the Distances from 8 o'Clock where that Course begins, to 2 o'Clock where it ends, being 18 Miles and a Half, I double that Sum, because the Book is mark'd only for every two Hours) and it makes 37 Miles for the Distance belonging to that Course. But if the Book had been mark'd for every Hour, as it is in the *Navy*, and aboard the *East-India Ships*, then I must have taken the Sum without doubling it for the Distance, and in the same Manner I reckon the other Course and Distance; all which will be as in the following Traverse-Table.

And then every thing be found as on the other Side, I set them down in their proper Columns as above.

Course



# The Traverse-Table.

135

Courses	Diff.	N.	S.	E.	W.
S $\frac{1}{4}$ E	18		18.0	0.9	
SW. by S $\frac{3}{4}$ W	37		27.4		24.8
SSW $\frac{3}{4}$ W	56		48.0		28.8
Difference of Latitude S.			93.4	0.9	53.6
					0.9
					52.7

Dep. W.

The several Courses and Distances in this Table, being look'd out and cast up as in the Rules for Traverse Sailing, (Page 52) I find my Difference of Latitude to be 93 Miles and 4 Tenths, and my Departure 52 Miles and 7 Tenths: Then I mark down (upon my Slate, or the Paper that I work upon) every Thing that is to be found, and as I find what they come to, I set against them as follows:

By	{	Course	S. 30 00 W.	{	Because the Diff. Lat. is S. and the Depart. W.
		Distance	108 Miles		<i>Note</i> , When the Tenths in any Side are more than 5, or half a Mile, you must call that Side 1
D.R.	{	Diff. of Lat.	93 S.	{	Mile more than you found it to be; but when they are less than 5, then you need take no Notice of them. As in this Case the Diff. of Lat. being 93.4 I reject the 4 Tenths, and call it only 93 Miles, and the Dep. being 52.7, instead of the 7 Tenths I put 1 Mile to it, and call it 53 Miles.
		Departure	53 W.		
		Lat. by D. R.	48 34 N.		
		Lat. Observation			
		Meridian Distance	00 53 W.		
		Longitude made	01 22 W.		
		Longitude in	05 09 W.		

But when you take the Difference of Latitude and Departure to find the Course by, then take them in Miles and Tenths.

Then in the first Place, with my Difference of Latitude 93.4, and my Departure 52.7 (as taught in Plane Sailing, *Case the 6th*) I find my Course to be 30 Degrees, and my Distance 108 Miles, which I set down against Course and Distance as above.

*Second*, For the Latitude by D. R.  
Take the Latitude sail'd from — 50 07 N.  
And the Diff. Lat. 93 Miles, or 1 33  
Sub. (as *per Rule*) gives Lat. D.R. 48 34 N.

*Third*, For the Meridian Distance.  
*Note*, The Meridian Distance on the first Day's Work, is always the same as that Day's Dep. which here is 0 53 W.

*Fourth*, For the Difference of Longitude.  
The Meridional Parts of }  
The Latitude sail'd from } 3485  
Of the Lat. by D. R. } 3343  
Meridional Difference of Lat. 142

Then I look for my Course 30 Degrees in the Tables of Diff. of Lat. and Dep. and for the Merid. Diff. of Lat. 142; in some of the Diff. of Latit. Columns belonging to that Course, the Dep. 82, which answers to that Diff. Lat. is my Diff. Long.

*Fifth*, For the Longitude made.  
The Longit. made on the first Day's Work, is always the same as that Day's Diff. of Long. which here is — 1 22 W.

*Sixth*, For the Longitude in. d. m.  
Take the Longitude sail'd from 3 47 W.  
And the Diff. Lon. 82 Miles, or 1 22 W.  
Sub. (as *per Rules*) gives Lon. in 4 09 W.  
H.

# 36 A Journal from *England* towards *Madeira*.

H	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Friday, May</i> the 4th, 1771.		
2	6		SWbW	N		Moderate Gales and fair Weather, at 8 (a. m.) saw a Ship to the northward.		
4	5	I						
6	5			N W				
8	5							
10	4	I	S W					
12	4	I						
2	4	I				Variation $\frac{1}{4}$ Point W.erly.		
4	4	I						
6	4	I						
8	5		SWbyS WNW					
10	4	I						
12	4							
Courfe	Diff.	S	W	Lat. by D R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
S33 $\circ$ W	114	96	61	46 $^{\circ}$ 58N.		1 $^{\circ}$ 54W.	2 $^{\circ}$ 55W.	6 $^{\circ}$ 42W.

The Variation being allowed, and the Distances summed up as before, the Traverse Table will be as follows.

Courfe	Diff.	N.	S.	E.	W.
SWbS W	43		31.9		28.9
SSW $\frac{3}{4}$ W	45		38.6		23.1
SbyW $\frac{1}{2}$ W	27		25.4		9.1
Diff. or Lat. 95.9 Dep. 61.1					

First, with my Difference of Latitude 95.9 and Departure 61.1 (by plane Sailing Case 6,) I find my Course to be 33 Deg. and my Distance 114 Miles.

Second, For my Latitude by D. R. Take the Latitude in yesterday 48 $^{\circ}$  34N. And my Diff. Lat. 96 Miles, or 1 $^{\circ}$  36S.

Third, For the Meridian Distance, Take the Mer. Diff. yesterday 0 $^{\circ}$  53W. And the Departure to-day — 1 $^{\circ}$  01W. Gives the Meridian Distance — 1 $^{\circ}$  54W.

By D R.	Courfe	—	33 $\circ$ 00W.
	Distance	—	114 Miles
	Diff. of Lat.	—	96 S.
	Departure	—	61 W.
	Latitude by D. R.	46 $^{\circ}$ 58N.	
	Lat. Observation		
D R.	Meridian Distance	1 $^{\circ}$ 54W.	
	Longitude made	2 $^{\circ}$ 55W.	
	Longitude in	6 $^{\circ}$ 42W.	

Fourth, For Difference of Longitude, Take the Mer. Parts of yest. Lat. 3343 And of the Latitude to-day 3200 Gives the Mer. Diff. of Latitude 143 with which and the Course (as in the first Day's Work) I find my Diff. of Longitude to be 93 Miles West.

Fifth, For the Longitude made, Take the Long. made yesterday 1 $^{\circ}$  22W. And the Diff. of Long. to-day } 1 $^{\circ}$  33W. 93 Miles, or —

Gives the Long. made to day 2 $^{\circ}$  55W.

Sixth, For the Longitude in, Take the Long. in yesterday 5 $^{\circ}$  09W. And the Diff. of Lon. to-day 1 $^{\circ}$  33W. Gives the Longitude in 6 $^{\circ}$  42W.



# A Journal from *England* towards *Madeira*. 137

H.	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Saturday</i> , <i>May</i> the 5th, 1771.			
2	4			S W	WNW	Moderate Gales and Cloudy.			
4	4								
6	4								
8	4	I		SWbySWbyN	$\frac{1}{2}$				
10	4	I							
12	4	I							
2	4	I	In 1st Reef both Topfails.						
4	4		SSW	W	I				
6	4								
8	4					Variation 1 Point W.erly.			
10	4								
12	4								
Courses		Diff.	S.	W	Lat. by D.R.	Lat. by Ob	Mer. Diff.	Lon. made	Lon. in
S 14 00 W		97	95 24	45 23 N.			2 18 W	3 29 W	7 16 W

The Lee-way and Variation being allow'd, as before taught, the Traverse-Table will be as follows.

Courses	Diff.	N.	S.	E.	W.	By D. R.	Course — S. 14 00 W.	
SW by S	24		20.0		13.3		Distance —	97 Miles.
S by W $\frac{1}{2}$ W	36		34.5		10.4		Diff. of Lat —	95 S.
South	40		40.0		1		Departure —	24 W.
			94.5		23.7		Latitude by D. R.	45 23 N.
							Lat. Observation	
							Meridian Distance	2 18 W.
							Longitude made —	3 29 W.
							Longitude in —	7 16 W.

First, The Course and Distance found (by Plane Sailing Case 6,) as before will be as in the other Column.

Second, For my Latitude by D. R.  
Take the Latitude in yesterday 46 58 N  
And the Diff. of Latitude 95 } 1 35  
Miles — — — — —  
Gives the Latitude by D. R. — 45 23

Third, For the Meridian Distance,  
Take the Mer. Dist. yesterday 1 54 W.  
And the Departure to-day — 0 24 W.  
Gives the Meridian Distance — 2 18 W.

Fourth, For the Diff. of Longitude,  
The Mer. Parts of yesterday's Lat. — 3200  
Of to-day's Latitude — — — — — 3063  
The Mer. Diff. of Latitude — — — — — 137  
with which, and the Course (as before) I find the Diff. of Long. to be 34 Miles West.

Fifth, for the Longitude made,  
Take the Long. made yesterday — 2 55 W.  
And the Diff. of Long. to-day — 0 34 W.  
Gives the Longitude made — — — — — 3 29 W.

Sixth, For the Longitude in,  
Take the Long. in yesterday — 6 42 W.  
And the Diff. of Longitude — — — — — 0 34 W.  
Gives the Longitude in — — — — — 7 16 W.

O o

The

H	K.	HK	F.	Courses	Winds	Lee-way.	Transactions, Sunday, May the 6th, 1771.		
2	4			S.	W SW.	1	Moderate Gales and Hazy the first Part, the latter fresh Gales and Rain.		
4	4								
6	4	1							
8	4			In 2d reef	both Top	fails.			
10	4			SSE	SW	1 1/2			
12	4						Variation 1 Point W.erly.		
2	4								
4	4								
6	4			Handed t	he Fore Top	fail.			
8	4			S by E	SW bW	2			
10	4						Tack'd		
12	3	1							
Courfe	Dist.	S.	E	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in	
S 39 00 E	93	7	60	44 11 N.		01 18 W.	02 07 W.	05 54 W.	

The Ship having her Starboard Tacks aboard, when the Lee-way and Variation are allow'd (as before taught) the Traverse-Table will stand as follows :

Courses	Dist.	N.	S.	E.	W.	By D.R.	Course ——— S. 39 00 E.	
SSE.	33		30.5	12.6			Distance ———	93 Miles
SE 1/2 E.	40		25.4	30.9			Diff. of Lat. ———	72 S.
SE	23		16.3	16.3			Departure ———	60 E.
			72.2	59.8			Lat. by D. R. ———	44 11 N.
							Lat. Observation	
							Meridian Distance —	1 18 W.
							Longitude made ———	2 7 W.
							Longitude in ———	5 54 W.

Having been very particular in explaining the Manner of working a Day's Work (in the three foregoing Days) and as all Day's Works where there is no Correction wanting, are to be work'd from the Difference of Latitude and Departure found by the Traverse-Table (as before) I have here only set down the Traverse-Table, and what all the other Things come to, and have left the finding them to exercise the Learner.



# A Journal from *England* towards *Madeira*. 139

H	K.	H	KF.	Courses	Winds	Lee way	Transactions, <i>Monday</i> , <i>May</i> the 7th, 1771.	
2	4			NWbW	SWbW	2		
4	3						Fresh Gales and Rain all these 24 Hours.	
6	3							
8	3							
10	3			Hand Main	Topfail			
12	3	I		N W	W S W	3		
2	3	I						
4	3	I						
6	3							
8	3							
10	3			N WN	W by S	3½	Variation 1 Point W.erly	
12	3							
Course	Diff.	N.	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
S 29 00 W	75	65	36	45 16 N.		1 54 W	3 00 W	6 47 W

The Ship having her Larboard Tacks Aboard, when the Leeway and Variation allowed, the Traverse Table will stand as follows.

Courses	Diff.	N.	S.	E.	W.	By D. R.	Course ——— N. 29 00 W	
N W	32	22.6			22.6		Distance ———	75 Miles
NNW	33	30.5			12.6		Diff. of Lat. ———	65 N.
N ½ W.	12	11.9			1.2		Departure ———	36 W.
		65.0			36.4		Latitude by D. R. —	45 16 N.
							Lat. by Observation	
							Meridian Distance —	1 54 W.
							Longitude made —	3 00 W.
							Longitude in —	6 47 W.

*To find the Course.*

Note, In this Case the Difference of Latitude being just 65 Miles without any Tenths, after you have put two Cyphers to the Departure, you must not divide it by 65, but by 650, the Figures being put to supply the Place of Tenths, as directed in the Rule for Plane Sailing.

$$\begin{array}{r}
 \text{Diff. Lat. (D. with Cyphers)} \\
 650 \quad \begin{array}{r} 3640 \\ 3900 \\ \hline \end{array} \quad \begin{array}{l} ) 56 \text{ the natu-} \\ \end{array}
 \end{array}$$

ral Tangent of the Course answering to 29° 15' or (neglecting the Minutes) 29° N. w.erly

140 A Journal from *England* towards *Madeira*.

H	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Tuesday, May the 8th, 1771.</i>		
2	3		WNW	S W	3½	Hard Gales and Squally Rain.		
4	3							
6	3		Handed the Forefail					
8	Lay too, up NW. off N.				5	Variation 1 Point W.erly.		
10	Drift 1 ½ Miles <i>per</i> Hour.							
12								
2			UpNbW off NEbN					
4								
6								
8			UpNNW. off NNE					
10								
12				Set the Forefail				
Course		Dist.	N. E.	Lat. by D.R.	Lat. by Ob.		Mer. Dist.	Lon. made
S. 8 co W		35	34	5	45 50N.	1 49N.	2 53W.	6 40W.

Having allowed the Leeway, and the Variation upon the first Course, and also from the Middle between what she comes up and falls off, (as taught in the Rules for laying too,) the Traverse Table will stands as follows.

Courses	Dist.	N.	S.	E.	W.	By	D.R.	Course ——— N. 8 00W.	
NWbW½W	18	13.9			11.4			Distance ———	35 Miles.
N N E	12	11.1		4.6				Diff. of Lat. ———	34 N.
NE by E	9	5.0		7.5				Departure ———	5 E.
NE	6	4.2		4.2				Latitude by D. R. ———	45 50N.
		34.2		16.3	11.4			Lat. Observation	
				11.4				Meridian Distance ———	1 49W.
								Longitude made ———	2 53W.
								Longitude in ———	6 40W.

Departure 4.9 E.



# A Journal from *England* towards *Madeira*. 141

H	K.	H	K.F.	Courfes	Winds	Lee way	Tranfactions, <i>Wednesday</i> , <i>May</i> the 19th, 1771.			
2	3			N W	W S W	4				
4	3						Fresh Gales the first Part, the latter moderate, with fmall Showers.			
6	3			W N W	S W	4				
8	3			Set Main Topfail						
10	3	I		N W	W S W	3				
12	3	I								
2	3	I		Set Fore Topfail			Variation 1 Point W.erly.			
4	4			W by S	S by W	2				
6	4									
8	4									
10	4			Out 2d Reef both Topfails						
12	4	I		W	S S W	I $\frac{1}{2}$				
Course		Diff.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer.	Diff.	Lon. made	Lon. in
S 54 00 W		72	42	58	46 32 N.			2 47 W	4 17 W	8 04 W

Courses	Diff.	N.	S.	E.	W.
N by W	12	11.8			2.3
NW by N	12	10.0			6.7
NN W	21	19.4			8.0
W	32				32.0
W by N $\frac{1}{2}$ W	9	0.9			9.0
		42.1			58.0

By D. R.	Course	N. 54 00 W
	Distance	72 Miles
	Diff. of Lat.	42 N.
	Departure	58 W.
	Latitude by D. R.	46 32 N.
	Lat. by Observation	
	Meridian Distance	2 47 W
	Longitude made	4 17 W
	Longitude in	8 04 W

142 A Journal from *England* towards *Madeira*.

H	K.	H	KF.	Courfes	Winds	Lee-way	Transactions, <i>Thursday</i> , <i>May</i> the 10th, 1771.		
2	4	I		W by N	SW by S	I	Moderate Gales and thick Hazy Weather.		
4	4	I							
6	4			Out 1ft Reef both Topails					
8	4	I		W	S S W	$\frac{1}{2}$			
10	4	I							
12	4	I							
2	4			W by S	S by W	$\frac{1}{2}$			
4	4								
6	4								
8	4						Variation 1 Point W.erly.		
10	3	I		W S W	S	$\frac{1}{2}$			
12	3								
Course	Diff.	S. W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in		
S 82 00 W	95	13 95	46 19 N.		4 22 W	6 33 W.	10 20 W		

Courses	Diff.	N.	S.	E.	W.
W by N	26	5.1			25.5
W b S $\frac{1}{2}$ W	27		2.6		26.9
W S W $\frac{1}{2}$ W	32		9.3		30.6
SW b W $\frac{1}{2}$ W	13		6.1		11.5
		5.1	18.0		94.5

Diff. of Latitude 12.9

By	Course	N. 82 00 W.
	Distance	95 Miles
	Diff. of Lat.	13 S.
	Departure	95 W.
D.R.	Latitude by D. R.	46 19 N.
	Lat. Observation	
	Meridian Distance	4 22 W.
	Longitude made	6 33 W.
	Longitude in	10 20 W.



# A Journal from *England* towards *Madeira*. 143

H	K.	HK	F.	Courfes	Winds	Lee-way.	Tranfactions, <i>Friday</i> , <i>May</i> the 11th, 1771.	
2	2	I		W SW.	S.		Little Wind, and fmall Showers of Rain.	
4	2	I						
6	2	I						
8	2							
10	2						A great Swell from the SW. from which I allow 6 Miles.	
12	2							
2	I	I		SW bW	S by E			
4	I	I						
6	I	I					Variation $\frac{3}{4}$ Point W.erly.	
8	I							
10		I						
12		I						
Courfe	Diff.	S.	W	Lat. by D. R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
S 57 00 W	34	19	29	46 00 N.		4 51 W.	7 15 W.	11 2 W

Courses	Diff.	N.	S.	E.	W.
S W b W	30		16.7		24.9
S W	10		7.1		7.1
NE b N	6	5.0		3.3	
		5.0	23.8	3.3	32.0
			5.0		3.3
			18.8		28.7

Cor- rected	Courfe	S. 57 00 W
	Distance	34 Miles
	Diff. of Lat.	19 S.
	Departure	29 W.
	Lat. by D. R.	46 00 N.
	Lat. Observation	
	Meridian Distance	4 51 W.
	Longitude made	7 15 W.
	Longitude in	11 02 W.

*Note*, In this Day's Work the Swell coming from the S.W. heaves the Ship toward the NE. and the Variation allowed upon it makes NE. by N. for the last Course in the Traverse-Table.

# 144 A Journal from *England* towards *Madeira*.

H.	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Saturday</i> , <i>May</i> the 12th, 1771.
2	4			Calm		
4	4					
6	4					
8	4					
10	4					
12	4					
2	4					
4	4					
6	4					
8	4		SSW	W		
10	4					
12	4	I				
Course Diff. S. W Lat. by D.R. Lat. by Ob. Mer. Dist. Lon. made Lon. in S42 00W 32 24.22 45 36N. 45 33N. 5 13W 7 50W 11 37W						

Tried the Current, and found it to set W S W. 1 Mile *per* Hour, at which Rate I allow it for this 24 Hours.

Zenith Distance 27 52 S.  
Declination 17 41 N.

Variation 1 Point W.erly.

Courses	Diff.	N.	S.	E.	W.
S by W	60		10.8		2.1
SW by W	24		13.3		20.0
			24.1		22.1

Course — S. 42 00 W.  
Distance — 32 Miles  
Diff. of Lat — 24 S.  
Departure — 22 W.  
Latitude by D. R. 45 36N.  
Lat. Observation 45 33N.  
Meridian Distance 5 13W.  
Longitude made — 7 50W.  
Longitude in — 11 37W.

*Note,* The Current setting WSW. 1 Mile *per* Hour, I allow the Variation upon it, which makes it S W. by W. and set it in the Traverse Table, with 24 Miles Distance, as above.



# A Journal from *England* towards *Madeira*. 145

H	K.	H	KF.	Courses	Winds	Lee way.	Transactions, Sunday, May the 13th, 1771.
2	3			S by W	W by S		Moderate Gales and fair Weather, at 9 (a. m.) spoke with a Ship from <i>Barbadoes</i> , and bound for <i>London</i> .
4	3	I					
6	4						
8	4						
10	4						
12	4						
2	4						Variation 1 Point W.erly.
4	4						
6	4						
8	4						
10	4						
12	4						
Courfe	Dist. S.	—	Lat. by D.R.	Lat by Ob.	Mer. Dist.	Lon. made	Lon. in
South	103 103	—	44 00N.	43 50N.	5 13 W	7 50 W	11 37 W

By  
D. R.  
since  
last  
Obfer.

{ Courfe ————— South  
Distance ————— 93 Miles  
Diff. of Lat. ————— 93  
Departure ————— 00  
Lat. by D. R. ————— 44 00N.  
Latitude Observation — 43 50N.

Cor-  
rect-  
ed

{ Courfe ————— South  
Distance ————— 103 Miles  
Diff. of Lat. ————— 103 S.  
Departure ————— 00  
Latitude by D. R. — 44 00 N.  
Lat. Observation — 43 50 N.  
Meridian Distance — 5 13 W  
Longitude made — 7 50 W  
Longitude in — — 11 37 W

In this Day's Work, there being 10 Miles Difference between the Latitude by Dead-Reckoning and Observation, I am to correct, and therefore I do not find the Meridian Distance, &c. by (D. R.) as I did when there was no Correction; but I mark them all down again as above, and correcting (as in Case the First, of the Rules for correct- ing) because my Courfe by D.R. since the last Observation was due South, I fet them all down, as in the above Correction.

146 A Journal from *England* towards *Madeira*.

H	K.	H K F.	Courfes	Winds	Lee-way	Tranfactions, <i>Monday</i> , <i>May</i> the 14th, 1771.		
2	4		SWbW	WNW		Moderate Gales and fine clear Weather		
4	4	I						
6	4	I						
8	4	I						
10	4							
12	4							
2	4	I	S S W			Variation 1 Point W.erly.		
4	4	I						
6	4							
8	4							
10	4							
12	4	I						
Course	Diff.	S. W	Lat. by D. R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in	
S 18 00 W	112	106	35	42 13 N.	42 04 N.	5 48 W	8 37 W	12 24 W

Courses	Diff.	N.	S.	E.	W.
S S W	60		55.4		23.0
S by W	42		41.2		8.2
			96.6		31.2

Cor-  
rect-  
ed

Course	—	S. 18 00 W.
Distance	—	112 Miles
Diff. of Lat.	—	106 S.
Departure	—	35 W.
Latitude by D. R.	—	42 13 N.
Lat. Observation	—	42 04 N.
Meridian Distance	—	5 48 W.
Longitude made	—	8 37 W.
Longitude in	—	14 24 W.

By  
D. R.  
since  
last  
Obfer.

Course	—	S. 18 00 W.
Distance	—	102 Miles
Difference of Lat.	—	97 S.
Departure	—	31 W.
Latitude by D. R.	—	42 13 N.
Lat. Obser.	—	42 04 N.

Having found as far as to the Latitude by  
Dead-Reckoning and Observation, I see  
they differ 9 Miles, therefore I correct (by  
Case the 2d) because my Course found by  
Dead-Reckoning since the last Obfer. is  
less than 33 Deg. and the Result is as above

H



# A Journal from *England* towards *Madeira*. 147

H	K.	H K F.	Courses	Winds	Lee-way	Transactions, <i>Tuesday</i> , <i>May</i> the 15th, 1771.		
2	4		S W	NW		Moderate and Fair.		
4	4	1						
6	4							
8	4							
10	3	1	SW $\frac{1}{2}$ W					
12	4	1						
2	4			N		Variation $\frac{1}{4}$ Point W.erly.		
4	3	1						
6	4	1						
8	3	1						
10	3	1						
12	3	1		N E				
Courfe	Diff.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in
S 47 00W	78	53	57	40 59N.	41 11 N	6 45W	9 53 W	13 40W

Courses	Diff.	N.	S.	E.	W.	Cor- rected	Courfe ——— S. 47 00 W.
SW $\frac{1}{2}$ S $\frac{1}{4}$ W	33		26.5		19.7		Distance ——— 78 Miles
SW $\frac{1}{4}$ W	58		38.9		43.0		Diff. of Lat ——— 53 S.
			65.4		62.7		Departure ——— 57 W.
							Latitude by D. R. 40 59N.
							Lat. Observation 41 11N
							Meridian Distance 6 45W.
							Longitude made— 9 53W.
							Longitude in—— 13 40W.

By D. R. since last Obfer.	Courfe ——— S. 44 00W.	New Departure——— 51
	Distance ——— 91 Miles	Departure by D. R.—— 63
	Diff. of Latit.——— 65 S.	
	Departure——— 63 W.	Their Sum——— 114
	Lat. by D. R. ——— 40 59N.	
	Latitude Observation—— 41 11N.	$\frac{1}{2}$ Sum, or True Dep.— 57 Miles

In this Case, the Course by D. R. since last Observation being more than 33, and less than 67 Degrees, I corrected by Case the 3d.

# 148 A Journal from *England* towards *Madeira*.

H	K.	HK	F.	Courses	Winds	Lee-way.	Transactions, <i>Wednesday</i> , <i>May</i> the 16th, 1771.		
2	4			W	S E		Cloudy the first Part, the latter moderate and Fair.		
4	4								
6	4								
8	4								
10	4				E				
12	4								
2	4						Variation $\frac{1}{2}$ Point W.erly.		
4	4								
6	4								
8	4	I							
10	4	I							
12	4	I			NNE				
Course	Dist.	S.	W	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in	
S 9 00 W	93	—	93	41 02 N.	41 11 N	8 18 W.	11 56 W.	15 43 W	

Courses	Dist.	N.	S.	E.	W.
W b S $\frac{1}{2}$ W	93		9.1		92.6
		Diff. Lat.		Dep.	

Corrected by Case the 4th, the Course by D. R. being more than 6 Points.

By D. R. since last Obser. { Course—W. by S.  $\frac{1}{2}$  W.  
Distance—93 Miles  
Difference of Lat—9 S.  
Departure—93 W.  
Latitude by D. R.—41 02 N  
Lat. Observation—41 11 N

Cor-

rected

{ Course ————— West  
Distance—93 Miles.  
Diff. of Lat.—00  
Departure—93 W.  
Lat. by D. R. —41 11 N.  
Lat. Observation—35 36 N.  
Meridian Distance—8 18 W.  
Longitude made—11 46 W.  
Longitude in—15 43 W.

Note, When the Course is due East or due West, as in this Case, then the Difference of Longitude cannot be found by the Course, and Meridional Difference of Latitude as before, but must be found as follows; look in the Tables of Difference of Latitude and Departure, for the nearest Degree to your Latitude, which here is 41, and in some of the Difference of Latitude Columns belonging to that Degree find your Departure, which in this Case is 93, the Distance answering to that which is 123, gives your Difference of Longitude.



# A Journal from *England* towards *Madeira*. 149

H	K.	H	K	F.	Courses	Winds	Lee way.	Tranfacti <sup>o</sup> ns, <i>Thursday</i> , <i>May</i> the 17th, 1771.																		
2	4	1			S by W	N.		Little Wind and Hazy all these 24 Hours.																		
4	3	1																								
6	3																									
8	3																									
10	3				SS W	N W																				
12	3																									
2	3							Variation $\frac{1}{2}$ Point W.erly.																		
4	3																									
6	3				SbW $\frac{1}{2}$ W	W NW																				
8	3																									
10	3																									
12	3																									
<table><tr><th>Course</th><th>Dist.</th><th>S.</th><th>W</th><th>Lat. by D.R.</th><th>Lat. by Ob.</th><th>Mer. Dist.</th><th>Lon. made</th><th>Lon. in</th></tr><tr><td>S 11 00 W</td><td>76</td><td>74</td><td>14</td><td>39 57 N.</td><td></td><td>8 32 W</td><td>12 15 W</td><td>16 2 W</td></tr></table>									Course	Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in	S 11 00 W	76	74	14	39 57 N.		8 32 W	12 15 W	16 2 W
Course	Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in																		
S 11 00 W	76	74	14	39 57 N.		8 32 W	12 15 W	16 2 W																		

Courses	Dist.	N.	S.	E.	W.
S $\frac{1}{2}$ W	28		27.9		2.7
SbW $\frac{1}{2}$ W	24		23.0		7.0
S by W	24		23.5		4.7
			74.4		14.4

By D. R.	Course	S. 11 00 W
	Distance	76 Miles
	Diff. of Lat.	74 S.
	Departure	14 W.
	Latitude by D. R.	39 57 N.
	Lat. Observation	
	Meridian Distance	8 32 W
	Longitude made	12 15 W
	Longitude in	16 02 W

*Note*, Having in the forgoing Day's Works given an Example to every Case of correcting, (for a single Day) I shall now set down two or three Days Work by D. R. and then shew how to correct them all together by an Observation, that is, how to correct for a longer Time than one Day.

R r

H

150 A Journal from *England* towards *Madeira*.

H	K.	H	KF.	Courfes	Winds	Lee-way	Transactions, <i>Friday</i> , <i>May</i> the 18th, 1771.		
2	3	I		S S W.	W by N		Little Wind and Cloudy		
4	3	I							
6	4								
8	4								
10	4			S by W	W				
12	3	I							
2	3	I							
4	3	I		S					
6	3				W S W				
8	3						Variation $\frac{1}{2}$ Point W.erly.		
10	3			S by W $\frac{1}{2}$ W	W				
12	3	I							
Course	Diff.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in	
S 12 00 W	83	82	82	38 35 N.		8 49 W	12 38 W	16 25 W	

Courses	Diff.	N.	S.	E.	W.
S b W $\frac{1}{2}$ W	30		28.2		1.1
S $\frac{1}{2}$ W	29		28.7		4.3
S $\frac{1}{2}$ E	12		12.0	0.6	
S by W $\frac{1}{2}$ W	13		12.6		3.2
			81.5	0.6	17.6
					0.6
					17.0

By D.R.	Course	S. 12 00 W.
	Distance	83 Miles
	Diff. of Lat.	82 S.
	Departure	17 W.
	Latitude by D. R.	38 35 N.
	Lat. Observation	
	Meridian Distance	8 49 W.
	Longitude made	12 38 W.
	Longitude in	16 25 W.



# A Journal from *England* towards *Madeira*. 151

H	K.	H K F.	Courses	Winds	Lee way	Transactions, <i>Saturday</i> , <i>May</i> the 19th, 1771.		
2	3	I	Sb W $\frac{3}{4}$ W	W by N		Little Wind and Fair Weather.		
4	3	I						
6	3	I						
8	3							
10	3	I						
12	3							
2	3		S by W	W		Variation $\frac{1}{4}$ Point W.erly.		
4	3							
6	3							
8	3							
10	3							
12	3							
Course	Dist.	S.	W	Lat. by D.R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 14 00 W	74	72	17	37 23 N.		9 06 W	13 1 W	16 48 W

Courses	Dist.	N.	S.	E.	W.
Sb W $\frac{1}{2}$ W	46		44.0		13.3
S $\frac{1}{4}$ W	28		27.7		4.1
			71.7		17.4

By D.R. { Course — S. 14 00 W.  
Distance — 74 Miles  
Diff. of Lat — 72 S.  
Departure — 17 W.  
Latitude by D. R. 37 23 N.  
Lat. Observation  
Meridian Distance 9 06 W.  
Longitude made — 13 01 W.  
Longitude in — 16 48 W.

# 152 A Journal from *England* towards *Madeira*.

H	K.	H K	F.	Courses	Winds	Lee-way.	Transactions, <i>Sunday</i> , <i>May</i> the 20th, 1771.		
2	4			S by W	W by N		Moderate Gales and Fair.		
4	4								
6	4								
8	4								
10	4								
12	4						Variation $\frac{1}{4}$ Point W.erly.		
2	4								
4	4			Sb W $\frac{1}{4}$ W					
6	4								
8	4								
10	4								
12	4								
Course	Diff.	S.	W	Lat. by D. R.	Lat. by Ob.	Mer. Diff.	Lon. made	Lon. in	
S 9 00 W	108	107	17	35 48 N.	35 36 N	9 23 W.	13 19 W.	17 06 W	

Courses	Diff.	N.	S.	E.	W.	By D. R. since yester- day Noon.	{	Course	S. 10.00 W.
S $\frac{3}{4}$ W	48		47.5	.	7.0			Distance	96 Miles
								Diff. of Lat.	95 S.
S by W	48		47.1		9.4			Departure	16 W.
								Lat. by D. R.	35 48N.
			94.6		16.4			Lat. Observation	—35 36N.

Now being to correct from the last Observation, which was on *Wednesday*, *May* 16th, I take the Northing, Southing, Easting, and Westing for every Day since, and bring them into a Traverse Table as follows :

By D. R. since the last Observa- tion.	N.	S.	E.	W.
On <i>Thursday</i> , <i>May</i> 17		74		14
On <i>Friday</i> 18		82		17
On <i>Saturday</i> the 19		72		17
On this Day as above.		95		16
Whole Diff. of Lat. by D. R. S. 323 Dep. 64 W.				
Gives Course by D. R. since last Obs, S. 11.00 W.				

My



My Course found by D. R. since the last Observation, being S. 11 00 W. which is less than 33 Degrees, I am to correct by Case the 2d, and to find every thing, except the Distance, as follows.

First, *For the true Difference of Latitude.*

Take the Latitude by the last Observation	— — — — —	41 11 N.
And the Latitude by Observation To-day	— — — — —	35 36 N.
Gives the Difference of Latitude	— — — — —	5 35
Which, multiplied by 60, make	— — — — —	335 Miles.

Second, *For the true Course.*

The Course by D. R. since the last Observation, being S. 11 00 W. I set it down for the true Course, as *per* Rule in Case the 2d.

Third, *For the true Departure.*

With the true Course 11 Degrees, and the true Difference of Latitude (divided by 2, because too big to be found in the Tables) which makes it 167.5, (by *Plane-Sailing*, Case the 2d.) I find the Departure 32.6, which, multiplied by the same Number the Difference of Latitude was divided by, *viz.* 2, gives 65.2 Tenths for the true Departure.

Fourth, *For the Meridian Distance.*

Take the Meridian Distance at the last Observation	— — — — —	8 18 W.
And the true Departure	— — — — —	1 05
Gives the Meridian Distance To-day	— — — — —	9 23 W.

Fifth, *For the Difference of Longitude.*

Take the Meridional Parts of the last Observation	— — — — —	2716
And Meridional Parts of To-day's Observation	— — — — —	2288
Gives Meridional Difference of Latitude	— — — — —	428
With the Half of which	— — — — —	214

(because the whole is too big to be found in the Tables) and the true Course 11 Degrees, I find the Difference of Longitude 41.6, which doubled (because the other was halved) gives, for the whole Difference of Longitude, 83 Miles.

Sixth, *For the Longitude made.*

Take the Longitude made in the last Observation — 11 56 W.  
 And the whole Difference of Longitude — 1 23 W.  
 Gives the Longitude made — 13 19 W.

Seventh, *For the Longitude in.*

Take the Longitude in last Observation — 15 43 W.  
 And the whole Difference of Longitude — 1 23 W.  
 Gives the Longitude in — 17 06 W.

Corrected {	Course — S. 11 00 W.	} these to be found again as follows {	S. 9 00 W.
	Distance —		108 Miles.
	Difference of Latitude - 335 S.		107 S.
	Departure — 65 W.		17 W.
	Latitude by D. R. — 35 48 N.		
	Latit. by Observation 35 36 N.		
	Meridian Distance — 9 23 W.		
	Longitude made — 13 19 W.		
	Longitude in — 17 06 W.		

The Course, Difference of Latitude, and Departure, as above, being what has been made since the last Observation (which was four Days ago) and as it is usual to set them down only as they are made from Noon to Noon, therefore they are to be rubbed out, and found again as follows :

*First*, Take the Latitude by D. R. Yesterday — 37 23 N.  
 And the Latitude by Observation To-day — 35 36 N.  
 Gives the Difference of Latitude — 1 47

*Second*, Take Yesterday's Meridian Distance — 9 06 W.  
 And the Meridian Distance To-day — 9 23 W.  
 Gives the Departure — 0 17

Then with the Difference of Latitude 107, and the Departure 17 Miles (by *Plane Sailing*, Case 6.) I find the Course to be 9 Degrees, Distance 108 Miles, as above.



H	K.	HK	F. Courses	Winds	Lee-way.	Transactions, <i>Monday, May the 20th, 1771.</i>
2	5		S by W	N.		By Reckoning I make my Course from the <i>Start</i> to the Island of <i>Madeira</i> S. 32 00 W. Distance 420 Leagues; Meridian Distance and Difference of Longitude as underneath.
4	5					
6	6	I				
8	7					
10	7	I				
12	8					
2	8					At <i>Noon</i> saw the Island of <i>Madeira</i> bearing SW. by W. Distance 14 Leagues. Variation 00.
4	8					
6	8	I				
8	8	I				
10	9					
12	9					

Courses	Dist.	S.	W	Lat. by D. R.	Lat. by Ob.	Mer. Dist.	Lon. made	Lon. in
S 19 00 W	213	202	70	32 14 N.		10 32 W.	14 43 W.	18 30 W.

Courses	Dist.	N.	S.	E.	W.
S by W	182		178.5		35.5
SW by W	42		23.3		34.9
			201.8		70.4

Course ——— S. 19 00 W.  
 Distance ——— 213 Miles  
 Diff. of Latitude 202 S.  
 Departure ——— 70 W.  
 Latitude by D. R. 32 14 N.  
 Meridian Distance 10 33 W.  
 Longitude made — 14 43 W.  
 Longitude in ——— 18 30 W.

The Bearing of the Land being SW. by W. distant 14 Leagues, or 42 Miles, I set them in the Traversal-Table as a Course, &c.

It being customary upon making the Land, to find what Course and Distance the Ship has made, by reckoning from the Place sailed from, to the Place arrived at, it is to be done as follows :

CASE the First. *When you keep the Account of Longitude in.*

With the Latitude and Longitude of the Place you sail'd from, and the Latitude and Longitude you are in by your Reckoning on the Day you make the Land, find the proper Difference of Latitude, the Meridional Difference of Latitude, and the Difference of Longitude in Miles, and with them find the Course and Distance, as it is shewn at large in *Mercator's Sailing*, Case the first, Page 55.

CASE the Second, *When you keep the Account of Longitude made.*

Then the proper Difference of Latitude, and the Meridional Difference of Latitude are to be found as before, and the Difference of Lon-

Longitude is to be found by bringing the Longitude made into Miles, with which proceed, as in Case the First.

The Agreement between these two Ways may be seen as follows :

On the 19th of May, when I made the Land, my Longitude in was	— — — — — 18 30 W.	On the same Day my Longitude made was	— — — — — 14 43 W.
Longitude of the Start. or Place I sailed from	3 47 W.	Which multiplied by	60
The Difference of Longitude	— — — — — 14 43		
Which multiplied by	— — — — — 60	Makes the Diff of Lon.	883 Mi.
Makes	— — — — — 883 Miles,	The same as in the other Case.	

*To find the Bearing and Distance of any Place from the Ship, upon any given Day.*

*Example.* Suppose I would know how *Madeira* bore off me, and what Distance, on the 14th of *May*, by the foregoing Journal.

*First*, Supposing I kept only the Account of Longitude in ;

Then, with the Latitude in,	41 11 N.	} 2716 M. P.	} And with Long. in — 15 43 W.
And the Latitude of Madeira	32 44 N.		
I find the proper Diff. of Lat	8 27	} 636	} I find the Diff. Long. 1 43 W.
Which multiplied by 60 makes	507 Miles		

Then with that Meridional Difference of Latitude, and Difference of Longitude, I find the Course to be S. 09 00 W. and the Distance 501 Miles, as in *Mercator*, Case 1.

But if I had kept only the Account of Longitude made, which is Difference of Longitude, then,

With the Longitude sail'd from — — — — — 3 47 W.

And the whole Diff. of Long. or Long. made — 11 56 Westerly.

By the Rules for Lon. p. 107, I should have found Lon. in 15 43 W.

And then I have given the Latitude and Longitude in, &c. as before.

I have, in the foregoing Journal, shewn how to correct, either for a single Day, or for a longer Time, and given Examples of every Case for correcting from one Observation to another ; but as it may happen that you may be some Days at Sea, from the Time of your leaving the Land before you have an Observation, and that when you get the first Observation, you may have Occasion to correct, and there being much the same Difference between working the Correction from one Observation to another, and between the first Observation and the Land, as there is between working the first Day's Work, and any of the following ones, I shall here give an Example from the foregoing Journal.



*To correct from the Time of leaving the Land to the first Observation.*

*Example.* Suppose that in the foregoing Journal, on the 3d of May, I was by Observation in Latitude 45 10 N. my Latitude by D. R. being 45 23 N. my Southing by D. R. 95, and Westing 24.

Now being to correct, and having no Observation before To-day, I must correct from the very Beginning of my Journal, that is, from the Time of my leaving the Land, by bringing the Northing, Southing, Easting, and Westing, for every Day I have been at Sea, into a Traverse Table, as follows ;

By D. R. from the Time of leaving the Land.	N.	S.	E.	W.
On the first Day.	—	93	—	53
On the second Day.	—	96	—	61
On the Day I correct.	—	95	—	24
Whole Diff. of Lat. by D.R. S. 284 Dep. 138 W.				

Gives the Course by D.R. from the Time of leaving the Land S. 26.00 W.

The Course found by D. R. from the Time of leaving the Land, being less than 33 Degrees, I am to correct by Case the Second, and to find every Thing, except the Distance, as follows :

*First, For the true Difference of Latitude.*

Take the Latitude of the Place sailed from — 50 07 N.

And the Latitude in by Observation — — 45 10 N.

Gives the true Difference of Latitude ——— 4 57 or 297 Miles.

*Second, For the true Course.*

The Course by D. R. since the Time of leaving the Land being S. 26 00 W. I set down for the true Course, as by the Rules for correcting, Case 2d.

*Third, For the true Departure.*

With the true Course 26 Degrees, and half the true Difference of Latitude 148.5, (because the whole is too big to be found in the Tables) by *Plane Sailing*, Case the Second. I find the Departure 72.3, which being doubled (because the Difference of Latitude was halv'd) gives 144.6 for the true Departure.

*Fourth, For the Meridian Distance.*

Whenever you correct from the Time of your leaving the Land, (as you do here) the Meridian Distance will always be the same as the true

T t

De-

Departure found by correcting, which in this Case is 145 Miles, or 2.25 W.

*Fifth, For the Difference of Longitude.*

Take the Meridional Parts of the Latitude sail'd from	3485
And of the Latitude in by Observation	<u>3044</u>
Gives the Meridional Difference of Latitude	<u>441</u>
With the Half of which	220.5

(because the whole is too big to be found in the Tables) and the true Course 26 Degrees, as directed in the first Day's Work, page 134) I find the Difference of Longitude 107.4, which doubled (because the other was halv'd) gives the true Difference of Longitude 214.8.

*Sixth, For the Longitude made.*

Whenever you correct from the Time of your leaving Land, as you do in this Case, then the Longitude made will always be the same as the whole Difference of Longitude found by the Correction, which in this Case is 215 Miles, or 3.35 W.

*Seventh, For the Longitude in.*

Take the Longitude of the Place you sail'd from	3° 47' W.
And the whole Difference of Longitude	<u>3 35 W.</u>
Gives the Longitude in	7 22 W.

Corrected	{	Course	— — — — —	S. 26 00 W.	}	These to be found again.	S 16 00 W.
		Distance	— — — — —				113 Miles.
		Difference of Latitude	— — — — —	297 S.			108 S.
		Departure	— — — — —	145 W.			31 W.
		Latitude by D. R.	— — — — —	45 23 N.			
		Latitude by Observation	— — — — —	45 10 N.			
		Meridian Distance	— — — — —	2 25 W.			
		Longitude made	— — — — —	3 35 W.			
		Longitude in	— — — — —	7 22 W.			

The Course, Difference of Latitude and Departure, as above, being what has been made in the whole, from the Time of leaving the Land, which is three Days, and it is usual to set them down only as they are made from Noon to Noon, therefore they are to be rubbed out, and found again as follows:

*First,* Take the Latitude by D. R. Yesterday — — 46 58 W.  
 And the Latitude by Observation To-day — — 45 10 N.  
 Gives the Difference of Latitude — — 1 48

*Second,* Take the Meridian Distance Yesterday — — 1 54 W.  
 And the Meridian Distance to To-day — — 2 25 W.  
 Gives the Departure — — — — 0 31

Then



Then, with the Difference of Latitude 108, and the Departure 31 Miles (by *Plane Sailing*, Case 6). I find the Course to be S. 15. 00. W. Distance 113 Miles, as above.

Having in the preceding Journal shewn how to find what Latitude and Longitude the Ship is in, on any Day, I shall, in the next Place, shew how,

*By that Longitude and Latitude in, to mark off the Place of the Ship on the Mercator's Chart:*

*Rule.* Lay a Ruler a-cross the Chart, in the Latitude your Ship is in; then look upon the Equinoctial, or Line marked with the Degrees of Longitude, for the Longitude your Ship is in by your Reckoning, and, setting one Foot of your Compasses in that Longitude, take the nearest Distance to some North and South Line, and from where that Line crosses the Edge of the Ruler that lies in the given Latitude, lay off that same Distance, by the Edge of the Ruler, to the Right-hand, if the Longitude you are in was to the Right-hand of the North and South Line, or to the left-hand, if it was to the Left; where this falls will be the Place of the Ship. But this will only do when the Longitude marked off the Chart, and your Reckoning of Longitude in are both counted in the same Meridian, therefore for a general Rule, take the following, *viz.*

*By the Latitude in, and Longitude made, to mark off the Ship's Place, &c.*

*Rule.* Set one Foot of your Compasses in the Place you take your Departure from, and take the nearest Distance to some North and South Line, and from where that Line falls upon the Equinoctial or Line marked with the Degrees of Longitude, set off that Distance the same Way as the Place lays from it, (that is, to the Right-hand, if the Place lies to the Right-hand of the North and South Line, or to the Left-hand, if it lies to the Left) and make a Mark with a black Lead Pencil; this Mark will serve to mark off by, till you come to take a new Departure, and then you rub it out, and make a new one, as before.

Then lay a Ruler a-cross the Chart in the Latitude you are in, and taking so many Degrees in your Compasses (from the Line of Longitude) as your Longitude made comes to, set them off from your black Lead Mark, to the eastward, if the Longitude made be East, or to the Westward, if it be West; where this falls will be the Longitude the Ship is in by the Chart, from which take the nearest Distance to some North and South Line, and from where that Line, &c. as in the first Case.

The

The Ship's Place on the Chart being found, as before taught, it remains in the next Place, to shew how to find the Bearing and Distance of any Place from the Ship ; and first,

*To find how any Place bears from the Ship.*

*Rule.* Lay a Ruler from the Place of the Ship to the Place you would know the Bearing of, then set one Foot of your Compass in the Center of some Compass near the Ruler, and take the nearest Distance to the Edge of the Ruler, then run one Foot of your Compasses along by the Edge of the Ruler, and observe what Point of the Compass the other comes nearest to, which will be the Bearing required.

*To find the Distance of any Place from the Ship.*

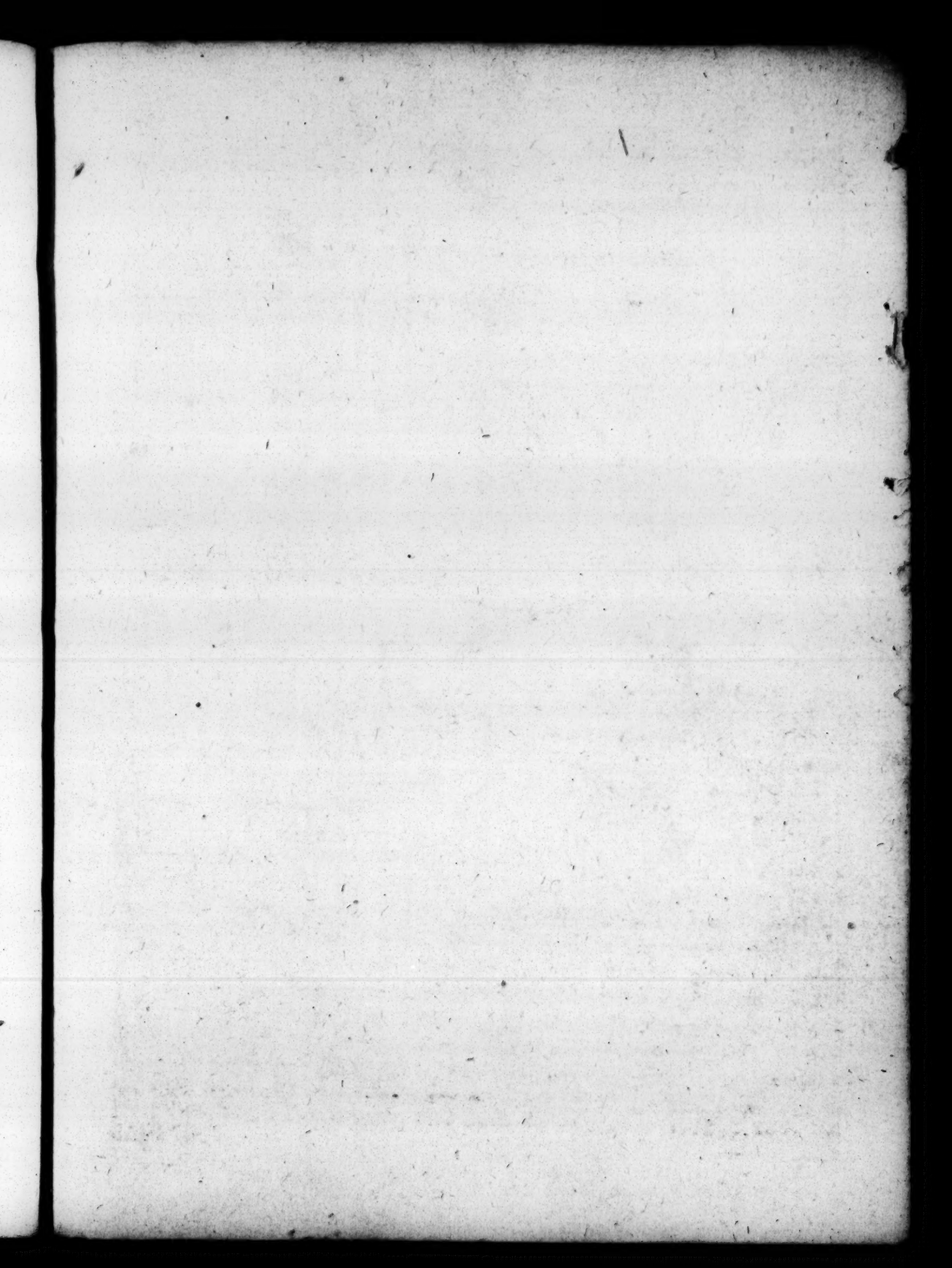
*Case the 1st.* If the Place be in the same Longitude that the Ship is in, (that is, if it bears due North or due South) then the Difference of Latitude between them, (found as by the Rules for Latitude, Page 105) and turned into Miles, or Leagues will be the Distance.

*Case the 2d.* If the Place be in the same Latitude that the Ship is in, that is, if it bears due East or due West, then take half the Distance between the Ship and the Place, in your Compasses, and setting one Foot (on the Line marked with Degrees of Latitude) in the Latitude the Ship is in, see what Latitude the other Foot will reach to, both above and below it; the Difference between these two Latitudes, found as *per* Rules for Latitude, will be the Distance required.

*Case the 3d.* If the Place be neither in the same Latitude nor Longitude with the Ship, then take the Difference of Latitude between them in Degrees, from the Equinoctial-line, and laying a Ruler from the Ship to the Place, apply one Foot of the Compasses so to the Edge of the Ruler, that the other Foot turned about may just touch some East and West Line that is crossed by the Ruler; then take the Distance along the Edge of the Ruler, from the Place where the Compasses rested, to the Place where the Ruler crosses the said East and West Line; that Distance measured on the Equinoctial, or Degrees of Longitude, will give the Distance in Degrees, which you may turn into Miles or Leagues, and in the same Manner as you find the Bearing and Distance of any Place from the Ship, you may also find the Bearing and Distance of one Place from another.







1485 w9